LIFE Recreation ReMEDIES

Synthesis of ReMEDIES actions and assessment of seagrass beds within the Solent Maritime SAC

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Synthesis of ReMEDIES actions and assessment of seagrass beds within the Solent Maritime SAC

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LIFE Recreation ReMEDIES (*LIFE18 NAT/UK/000039)*

Reducing and Mitigating Erosion and Disturbance impacts affecting the Seabed.

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Foreword

Natural England commissioned a project to synthesise the monitoring and project actions in the Solent Maritime Special Area of Conservation (SAC) that have taken place over the course of the LIFE Recreation ReMEDIES: ‘Reducing and Mitigating Erosion and Disturbance Impacts affecting the Seabed’ project (LIFE18NAT/UK/000039) and contributes to action D1 – Monitoring.

Outputs of the project are a summary of the seagrass beds with which the ReMEDIES project has interacted and how they have changed over the course of the project. Along with a summary of the actions taken as part of the ReMEDIES project within the Solent Maritime SAC.

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Executive Summary

Seagrasses are marine flowering plants that form extensive meadows in intertidal and shallow, subtidal, coastal environments. Seagrass meadows are among the most productive ecosystems in the world and provide habitats and food for a diversity of marine life (Natural England, 2023). They provide a wide range of natural capital benefits, such as carbon storage, water quality, flood risk management, fish nursery grounds, and biodiversity, which benefit both people and nature (Lima et al., 2023).

The EU LIFE Recreation ReMEDIES project, or 'Reducing and Mitigating Erosion and Disturbance Impacts affecting the Seabed,' ran from July 2019 to October 2024. One of the five focal areas for the REMEDIES project was the Solent Maritime Special Area of Conservation (SAC). The SAC includes extensive areas of mudflats and sandbanks which support sensitive seabed habitats, including both intertidal and subtidal seagrass beds. Within the Solent Maritime SAC, the ReMEDIES project focused on reducing recreational impacts on seagrass meadows through restoration and behavioural change.

As part of the ReMEDIES project, monitoring data were collected across selected sites within the Solent Maritime SAC to help understand the extent and condition of seagrass habitat. Natural England has a statutory duty to report on the condition of the seagrass habitats within SAC sites every six years. In 2018, the condition of this habitat was recorded as 'Unfavourable/Unknown' (Natural England, 2018). This report was commissioned to provide a:

- Synthesis of the activities delivered through the ReMEDIES project.
- Summary of the findings from data and reports collected through ReMEDIES.
- Description of any observed changes in seagrass habitat condition.
- Summary of potential drivers for change.
- Recommendations to inform the condition assessment that will be undertaken by Natural England to determine whether the seagrass habitat condition can be changed.

After a comprehensive review and cataloguing of all available ReMEDIES reports and data related to the Solent Maritime SAC, the information was organized into coherent site groupings to enable data analysis. This partly overcame data limitations, but inconsistent survey methods and data gaps prevented some reliable comparisons between sites and over time using inferential statistics. However, some important variables were selected and analysed using descriptive statistics to provide robust indicators of seagrass condition and recreational use.

This report will inform a future condition assessment of seagrass at sites surveyed through the ReMEDIES project, so can only draw a recommendation based on a specific suite of data. A review of the data provided gave some indication of seagrass condition and changes in recent years, relevant to some habitat attributes, which are:

- Extent of the seagrass beds in the Solent has generally increased (habitat attribute 1.01 Extent and distribution).
- In some locations on the Isle of Wight, seagrass cover either declined or stabilised (3.14 Structure: biomass).
- Seagrass leaf length (an indicator of health and productivity) has decreased at some sites and is unchanged at others (3.14 Structure: biomass).
- Seagrass infection or disease is worsening at some sites (3.09 Structure: non-native species and pathogens).
- There is no clear trend in the abundance of algae across seagrass sites (related to 6.04 Supporting processes: water quality – nutrients).

From this assessment, it is apparent that there are positive, negative, and inconclusive indicators of seagrass condition at sites across the Solent. It is, however, likely that seagrasses continue to suffer from pressures driving change in the Solent (e.g., physical disturbance, poor water visibility and quality, and disease), and their condition is recommended to be considered unfavourable.

The ReMEDIES project has implemented actions for the restoration and conservation of seagrass meadows through the seeding of existing meadows, the initiation of less damaging mooring and anchoring systems, and attempts to change stakeholder behaviour to protect seagrass habitat.

It was not possible to compare sites with ReMEDIES interventions and those without, to distinguish the likely effects of activities on seagrass condition because there was insufficient comparable data for specific variables to provide evidence or reliable results. However, there are indications that actions have driven positive change by reducing anchoring and mooring at Yarmouth and encouraging water users to avoid seagrass beds at Osborne Bay.

As many of the interventions have only been applied in the last two years, it is too soon to have confidence that these positive effects will be replicated elsewhere and will last, and the ecological implications of ReMEDIES actions may take many years to emerge, highlighting the importance of continued monitoring.

The ReMEDIES project generated numerous good examples of seagrass monitoring and data collection. However, there is scope to improve future monitoring of seagrass meadows in the Solent, such as:

- Developing a data collection protocol.
- Collecting data on both seagrass quantity and quality.
- Using and retaining one coordinate and site naming convention.
- Coordinating the delivery of surveys across partner organisations.
- Coordinating people and resources to facilitate more joined-up working.
- Coordinating data collection, monitoring, and data sharing across Defra.

Contents

1. Introduction

1.1 Background

Seagrasses are marine angiosperms (flowering plants) that form extensive beds or 'meadows' in intertidal and shallow, subtidal, coastal environments. Seagrasses are dependent on high levels of light for photosynthesis to grow, and they generally can only be found to a depth of around four metres in the UK (The Wildlife Trusts, 2024).

Seagrass meadows are among the most productive ecosystems in the world and provide habitats and food for a diversity of marine life (Natural England, 2023). They also provide a wide range of natural capital benefits, such as carbon entrapment and long-term storage, improving water quality, providing coastal protection from marine hazards (e.g. storms, pollution events), providing food and nursery grounds for a variety of species (e.g. fish, crabs, marine mammals, and birds) and promoting biodiversity. Seagrass ecosystem services benefit both people and nature (Lima et al., 2023), and include:

- Provisioning services such as fisheries.
- Regulating services such as carbon sequestration.
- Supporting services such as primary production and biodiversity.
- Cultural services such as recreation and eco-tourism.

Seagrass meadows show a wide but patchy distribution along the UK coast, and are declining in both quality and quantity nationally, with a loss of 44% of seagrass habitat in the UK since the 1930s (Gamble et al. 2021). Many remaining seagrass meadows have been assessed to be in an 'unfavourable' condition. The main causes of this decline are attributed to the 'wasting' disease, caused by the pathogen *Labyrinthula zosterae*, and to high levels of anthropogenic activity (e.g. water pollution, recreation, physical modification, fisheries). The UK Government's 25-Year Environmental Plan aims to secure clean, healthy, productive, and biologically diverse seas and oceans, and includes seagrass beds as a priority habitat (Defra, 2018).

The EU LIFE Recreation ReMEDIES project 'Reducing and Mitigating Erosion and Disturbance Impacts affecting the Seabed' (project reference: LIFE 18 NAT/UK/000039) ran from July 2019 to October 2024. The project aimed to provide the tools to deliver the conservation needed to move intertidal and subtidal mud and sand habitats towards 'favourable' condition in five internationally designated sites called 'Special Areas of Conservation' (SACs) between Essex and the Isles of Scilly.

The designated sites support important seagrass meadows. The conservation actions within the seagrass meadows included restoration, education and raising awareness, and reducing recreational pressures. Specific actions were carried out at sites where seagrass meadows had been lost, fragmented, or degraded by historic impacts from either wasting disease, or human activity (e.g. mooring, anchoring, trampling, and specific fishing practices such as potting or bottom-set nets).

The project was led by Natural England, in partnership with Ocean Conservation Trust, Marine Conservation Society, the Royal Yachting Association, Plymouth City Council, and Tamar Estuaries Consultative Forum, and was in collaboration with a range of stakeholders across the wider marine and coastal community.

One of the five focal areas for the ReMEDIES project was the Solent Maritime SAC (Figure 1). This Marine Protected Area (MPA) is a complex site encompassing a major estuarine system and a cluster of smaller estuaries. The SAC includes extensive areas of mudflats and sandbanks, with Annex I Qualifying Features, including:

- Mudflats and sandflats not covered by seawater at low tide, and,

Sandbanks which are slightly covered by sea water all the time (see websites section within references)

These Annex I habitats support sensitive seabed habitats, including seagrass that is recorded by the EUNIS habitat classification system (Moss, 2008) as either intertidal seagrass beds (A2.61) or subtidal seagrass beds (A5.53).

Natural England has a statutory duty to report on the condition of the seagrass meadow habitats within SAC sites every six years. In 2018, Natural England's Condition Assessment of the Solent Maritime SAC recorded both intertidal and subtidal seagrass beds as 'Unfavourable/Unknown' (Natural England, 2018).

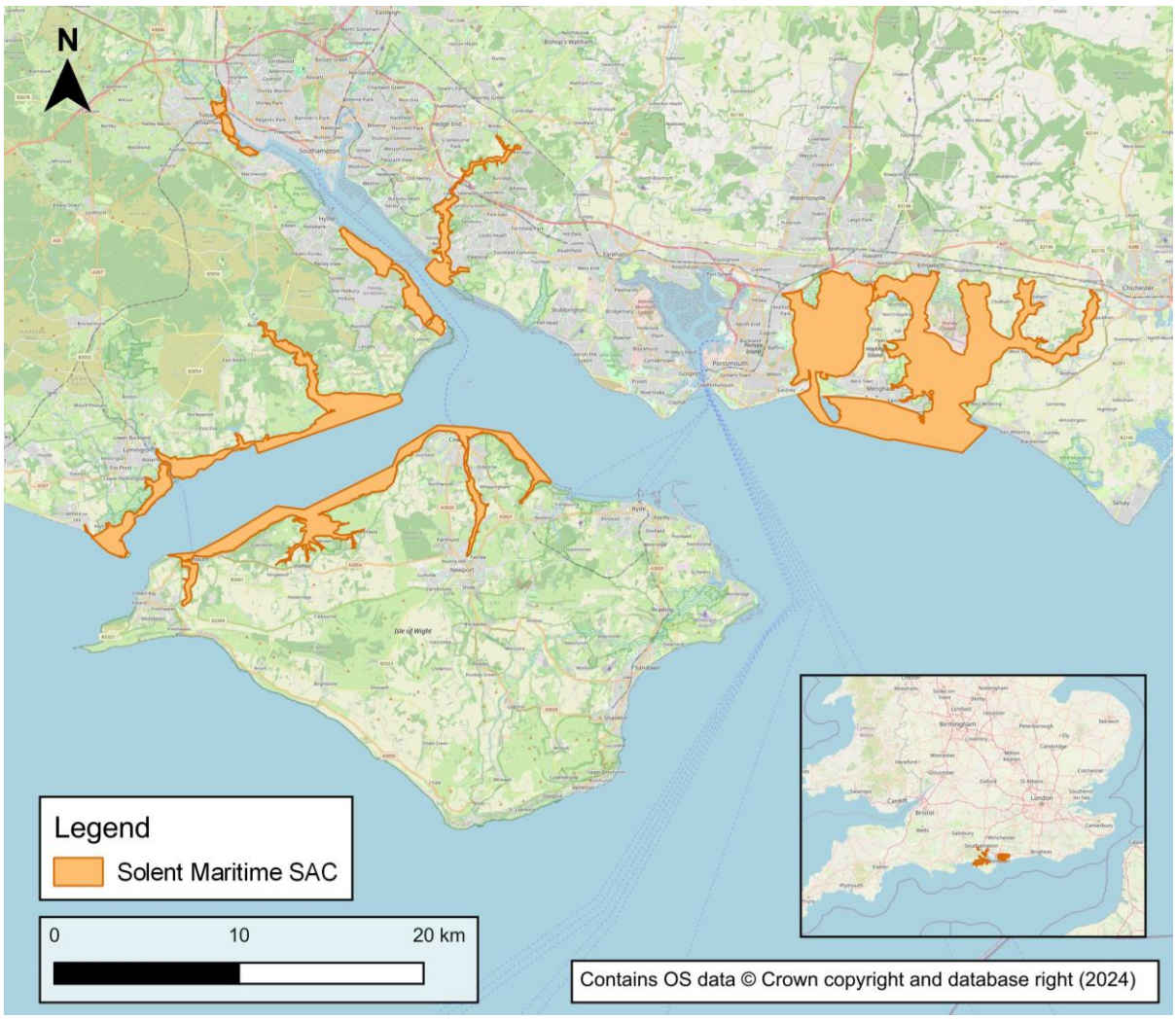

Figure 1: Map of Solent Maritime Special Area of Conservation

In addition to its conservation importance, the Solent is a hotspot for marine and coastal recreational activities including yachting, dinghy racing, anchoring, bathing, paddle boarding, and dog walking. It is used by many commercial and military vessels including ferries, cargo ships, and for fisheries. The Solent also hosts major ports, including commercial and military ports at Southampton and Portsmouth, ferry ports for the Isle of Wight, numerous marinas, leisure harbours, and safe launching facilities for trailer boats in many locations. These activities have the potential to interact with and disturb sensitive seabed habitats such as seagrass.

1.2 Scope of the report

As part of the ReMEDIES project, Natural England has commissioned a variety of seagrass and recreational activity surveys across the Solent Maritime SAC. The approach to surveying included a range of different stakeholders, survey techniques and survey frequencies. This report compiles the data from these surveys coupled with additional information (where available) from other organisations and analyses them to inform the condition of seagrass within the project area.

Most monitoring data were available from sites at Yarmouth, Cowes, and Osborne Bay (Isle of Wight,) and to the west of the mouth of the Beaulieu River on the mainland because these were the core areas where ReMEDIES actions took place. However, additional survey data were available from other sites on the Isle of Wight and Langstone and Chichester Harbours. In the Solent Maritime SAC, the ReMEDIES project included a suite of actions implemented to improve seagrass conditions, namely:

- C1: Stakeholder behaviour.
- C2: Training of boat users.
- C3: Installation of Advanced Mooring Systems (AMS).
- C4: Active seagrass restoration.
- C5: Managing access through a Voluntary No Anchor Zone (VNAZ).
- D1: Monitoring.
- E1: Community Engagement and Education.

1.3 Aims and objectives

The aim of this report is to provide a synthesis of the activities of the LIFE Recreation ReMEDIES project and any observed changes in seagrass during the project from monitoring within the Solent Maritime SAC.

Its objectives are to:

- Summarise the actions taken through the ReMEDIES project to improve the condition of seagrass.
- Review the survey and monitoring data and reports available.
- Identify any effects of the project actions on seagrass habitat.
- Propose seagrass condition recommendations and discuss potential drivers of change.

The report therefore:

- Summarises the actions taken through the ReMEDIES project to improve the condition of seagrass (Section 2).
- Reviews the survey and monitoring data (Sections 2 and 3).
- Identifies any effects of the project's actions on seagrass extent and condition (Section 3).
- Provides recommendations to inform the condition of seagrass beds (Section 3).
- Discusses potential drivers of change (Section 3).
- Makes recommendations for future survey and monitoring protocols (Section 4).

2. Methods: data review and analysis

2.1 Data review

Data and reports were supplied by Natural England from their ReMEDIES project library (see Appendix A: Data catalogue; Appendix B: GIS data; Appendix C: Reports; and, Appendix D: Additional data).

A suite of tables was compiled to ensure that the data provided for each seagrass site reported in the library was catalogued and formatted consistently (Appendix A). Formatting the data enabled more standardised comparison and general trends to be extracted to understand any changes in seagrass meadows across the Solent.

Using the data from the tables in Appendix A, alongside the GIS data (Appendix B), sites that were geographically coherent with each other were grouped into larger units. This grouping exercise was undertaken to promote consistency and enable robust data comparisons between sites. The following sites containing grouped information were defined (Figure 2):

- **Mouth of Beaulieu River** - This encompasses the open coast between Rolf Park Farm and Lepe Country Park.
- **Chichester Harbour** – The extent of the waterbodies of the same name.
- **Cowes** - The coastline from Gurnard's northern boundary to the natural break in the coastline at East Cowes Beach, incorporating the Medina.
- **Gurnard** - This corresponds to the natural boundary of the bay, with its northern limit at Gurnard town's northern boundary.
- **Langstone Harbour** – The extent of the waterbodies of the same name.
- **Osborne Bay** - This extends along the coast from the end of East Cowes Beach to Palmer's Brook at King's Quay.
- **Thorness Bay** - This is defined by the natural configuration of the bay.
- **Yarmouth -** This comprises all surveys conducted from Fort Victoria to Bouldnor.

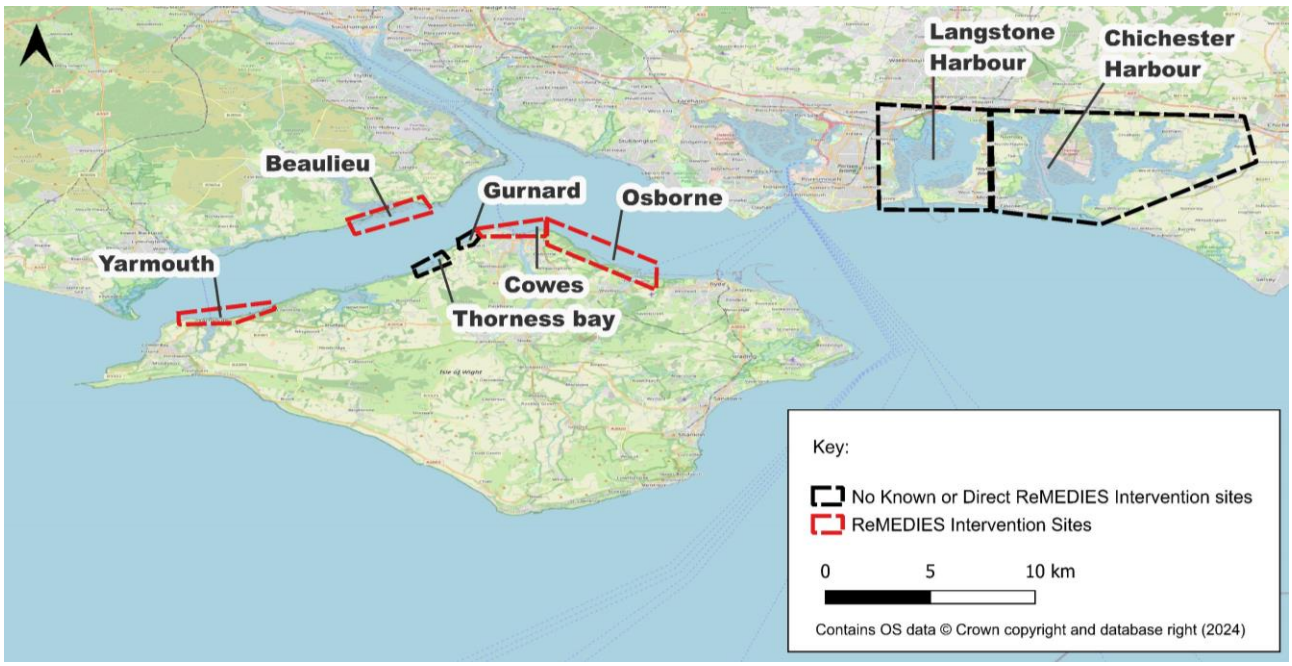

Figure 2: Main ReMEDIES site areas* identified by the study (* Beaulieu refers to the Mouth of Beaulieu River; Osborne refers to Osborne Bay).

2.2 Data limitations

The focus of data collected throughout the ReMEDIES project was for subtidal seagrass at the ReMEDIES intervention sites (Figure 2). Outside of this, various datasets from different sources were available for both subtidal and intertidal seagrass. Whilst these provide a wider context for seagrass habitats within the Solent Maritime SAC, they were more limited as informing ReMEDIES actions was not the main focus of the survey.

There were limitations associated with the data collected either for the ReMEDIES project or subsidiary data that can help inform the ReMEDIES project:

- **Variability in sampling methods** - There were differences in the approaches used for sampling, observed across years and between different survey teams. These resulted in inconsistencies in how data were collected.
- **GIS data reporting issues** - The methods of reporting data or transposed into GIS layers is not standardised, making interpretation difficult, despite using survey protocols.
- **Poor water visibility** – At times, deep, turbid water and seaweed or algae cover impaired the surveyors' ability to accurately identify seagrass cover or density and substrate type.
- **Access limitations** - Some sites were inaccessible, preventing surveys from being undertaken due to specific risks or site conditions. For example, the Natural England Dive Surveys in 2024 could not survey at the Cowes subtidal seagrass bed due to the strength of currents and poor visibility.
- **Time constraints** - A short survey window (often just two hours due to tidal constraints) necessitated multiple repeat surveys, complicating scheduling. This

short survey window also affected the extent and coverage of surveys achievable within the time constraints of the project.

- **Lack of collaboration between teams** - Multiple teams conducted fragmented surveys across the Solent. A more coordinated effort could have been more cost-effective and comprehensive, allowing partners to collect data in a coordinated and unified fashion.
- **Inconsistent site naming** - Differences in site naming conventions across surveys made comparisons and data compilation challenging, hindering meaningful year-to-year and site-to-site analysis.
- **Inconsistency in units used** - There is a difference between seagrass density and percentage cover, however, the two were used interchangeably in some reports (e.g. Perry 2024). Using one or the other, rather than both, would improve the ability to compare data.
- **Inconsistency in the coordinate systems/geo-location used** - The various data sets collected used different coordinate systems (e.g. degrees and minute decimals, or degree decimals, or a bearing and a distance). These differences made the compilation and visualisation of the datasets difficult and created inaccuracies.

Despite these limitations, once the data had been reviewed and formatted to enable robust comparison, it provided valuable insights into seagrass trends within the Solent Maritime SAC.

The ReMEDIES project library also includes data additional to seagrass information in the form of annual surveys recording the recreational activities across five sites in the Solent Maritime SAC for 2021-2023.

2.3 Data analysis

The organisation of reports (Appendix C) and data into a catalogue (Appendix A) facilitated the identification and extraction of comparable datasets for analysis. Due to data gaps, inconsistencies and limitations, inferential statistics would not provide reliable evidence of differences or changes. However, by using a considered selection of quantitative data from specific sites and variables, an informative series of descriptive statistics were possible. These are presented as either histograms or box plots, depending on the most effective way of presenting the results, using R (version 4.2.2). They comprise ecological data in the form of:

- Seagrass extent across six sites in the Solent Maritime SAC.
- Seagrass % cover in four ReMEDIES sites.
- Seagrass leaf length for four ReMEDIES sites.
- Algae % cover for four ReMEDIES sites.
- Seagrass infection scores for four ReMEDIES sites.

The quantitative results also include:

- Recreational use for five sites in the Solent Maritime SAC.

The descriptive statistics, and commentary on qualitative information, provide sufficient indications of changes and trends across the ReMEDIES sites and years.

3. Results of the data analysis

3.1 ReMEDIES actions

The project included a suite of activities (Table 1) that can be characterised as:

- Data collection activities.
- Actions that could have a direct impact on seagrass extent and/ or condition.
- Activities which have the potential to indirectly enhance conservation efforts.

Data collection activities consisted of the range of seagrass ecological monitoring data for the Solent Maritime SAC collated in the project library (analysed in this report) as well as recreational surveys at ReMEDIES intervention sites and non-direct intervention sites. For the recreational data, surveys have been conducted annually from 2021 to 2024, but for the purpose of this project were only available up to 2023. However, it is worth noting that a separate report is being prepared by Hampshire and Isle of Wight Wildlife Trust that will fully analyse the complete dataset.

Direct actions to conserve and restore seagrass consisted of the introduction of Advanced Mooring Systems (AMS) at three ReMEDIES sites and a Voluntary No Anchor Zone (VNAZ) at Osborne Bay. These actions were all undertaken within sites off the Isle of Wight. Actions at Osborne Bay were only implemented very recently (March 2024). On the mouth of the Beaulieu River site, active restoration activities have occurred, although some of this only within the last year (March 2024) (Table 1).

Indirect support for seagrass conservation within the Solent Maritime SAC through the ReMEDIES programme included the development of training materials for boat users. This was disseminated at local boat shows and online saveourseabed including through a range of webinars. Information panels were also installed to raise the profile and inform the public of the value of seagrass environments.

Table 1: Summary of ReMEDIES project actions with reference to information availability

Action	Method	Sites	Dates	Notes
C1: Stakeholder behaviour	• Recreational activity surveys	• Yarmouth West • Bouldnor • Osborne Bay • King's Quay • Langstone Harbour	• 2021-2024	Also interviews, meetings and research
C2: Training of boat users	• Guides, webinars, talks, videos	• Boat shows, festivals	• 2021-2024	Some available online
C3: Installation of Advanced Mooring Systems (AMS)	N/A	• 4 at Yarmouth • 2 at Cowes • 8 at Osborne Bay	• 2020 & 2021 • Dec 2022 • Mar 2024	Advanced Mooring Systems installed in Osborne Bay are for use as markers only-
C3: Seabed Clean Up	• Digital walkover using aerial footage. • Ground truthing surveys	• Intertidal areas of the Solent Maritime SAC	• 2023	Data also collected on anchoring and mooring pressure
C4: Active seagrass restoration	• [1]Seed bags across 1ha • [2]Seed injection of 1.5ha	• Mouth of Beaulieu River	• [1]Mar 2022 • [2]Nov 2023 • [2]Apr 2024	N/A
C5: Managing access through installation of a Voluntary No Anchor Zone (VNAZ)	N/A	• Osborne Bay	• Mar 2024	Three Community Conversations were held to discuss the VNAZ proposal and ensure local users were supportive of the plan

Action	Method	Sites	Dates	Notes
D1: Monitoring	• Surveys collated in the project library	• Numerous sites	• 2018-2024	N/A
E1: Community Engagement and Education	• Information panels	• Lepe • Yarmouth • Cowes • Hayling Island • Additional panels at several marinas throughout the Solent	• 2023/2024	Also, at events and talks

3.2 Review of the ReMEDIES data

The ReMEDIES sites (i.e. Yarmouth, Cowes, Osborne Bay, and the mouth of the Beaulieu River) showed greater comparability than other non-ReMEDIES sites in the Solent. Several surveys were conducted by the same organisations, following the same data collection protocols. At these ReMEDIES sites, a mix of quantitative (e.g. percentage, and counts) and qualitative (e.g. categories, comments) data were collected (Table 2).

Subtidal surveys involving diving, drop-down cameras, and echosounders provide the core ecological data capable of some robust analyses. A run of subtidal surveys is available for:

- 2018, 2021 and 2024 for Yarmouth and mouth of the Beaulieu River
- 2020, 2021 and 2024 for Osborne Bay.
- 2020 and 2021 for Cowes.

Surveys often include estimates of percentage cover, especially for *Zostera* spp. and algae (Table 2). Seagrass density counts, often converted to m^2, were quite frequently recorded, as were the lengths of the longest leaves. Presence/absence data included seagrass flowering and observations of attached eggs (e.g. of invertebrates). A scoring system (from 0-5) was always used to score the effects of epiphytes, disease and infection on the seagrass samples collected from diver surveys. Non-native species were a frequent consideration for the surveys at ReMEDIES sites, especially wireweed (*Sargassum muticum*), with estimates of % cover or qualitative notes made. The substrate type was often described (e.g. mud, sand) and anthropogenic impacts were often noted (e.g. anchor scars, litter).

Most survey effort focused on subtidal seagrass meadows and therefore nearly all survey data referred to *Zostera marina*; however, there were some records of *Zostera noltii*, and some surveys did not specify a seagrass species. Different surveys focused on different parameters, some were often collected (e.g. cover and leaf length of *Zostera spp.*, algae abundance, and a description of sediment type) whereas others were collected occasionally (e.g. cover of bare ground, and kelp cover), and some seldom (e.g. *Zostera* seeding).

Additional comments were usually made to support each survey, including observations on water visibility, rare or notable species and seagrass condition, although there was no standardised approach to reporting. Recreational survey results are available for the Yarmouth and Osborne Bay sites, but not for the mouth of the Beaulieu River or Cowes.

Table 2: Summary table for the core data around the ReMEDIES intervention sites (*survey completed towards the end of the project, so data not analysed in this report). EA = Environment Agency; NE = Natural England; Ha = Hectares.

Site name	Yarmouth					Mouth of Beaulieu River				Cowes		Osborne Bay					
Survey year	**2018**	**2021**	**2022**	**2023**	**2024**	**2018**	**2021**	**2024a**	**2024b**	**2020**	**2021**	**2020**	**2021**	**2022**	**2023**	**2024a**	**2024b**
Methods	Drop-down camera with 1m^2 quadrats	Diving with 0.25m^2 and diving with 0.0625m^2 quadrats	N/A	N/A	Diving with 0.25m^2 quadrats and diving with 0.0625m^2 quadrats	Drop-down camera with 1m^2 quadrats	Diving with 0.25m^2 and diving with 0.0625m^2 quadrats	Diving with 0.25m^2 quadrats and diving with 0.0625m^2 quadrats	Drop-down camera with 1m^2 quadrats	Drop-down camera with 1m^2 quadrats, echosounder survey	Diving with 0.25m^2 and diving with 0.0625m^2 quadrats	Drop-down camera with 1m^2 quadrats, echosounder survey	Diving with 0.25m^2 and 0.0625m^2 quadrats	N/A	N/A	Diving with 0.25m^2 quadrats and diving with 0.0625m^2	Drop-down camera with 1m^2 quadrats
Data collected by	EA	NE Dive Team	N/A	N/A	NE Dive Team	EA	NE Dive Team	NE Dive Team	EA	EA	NE Dive Team	EA	NE Dive Team	N/A	N/A	NE Dive Team	EA
Seagrass bed extent	Ha	N/A	N/A	N/A	N/A	Ha	N/A	N/A	N/A	Ha	N/A	Ha	N/A	N/A	N/A	N/A	N/A
Seagrass cover	% *Zostera marina*	% *Zostera marina*	N/A	N/A	Zostera marina %	% *Zostera marina*	% *Zostera marina*	Zostera marina %	Zostera marina %	% *Zostera marina*	% *Zostera marina*	% *Zostera marina*	% *Zostera marina*	N/A	N/A	Zostera marine %	Zostera marina %
Seagrass density	N/A	m^2	N/A	N/A	Shoot count	N/A	m^2	Shoot count	N/A	N/A	m^2	N/A	m^2	N/A	N/A	Shoot count	N/A
Seagrass height	N/A	N/A	N/A	N/A	-	N/A	-	At restoration site	N/A	Bioheight	N/A	Bioheight	N/A	N/A	N/A	At AMS/ VNAZ site	N/A
Seagrass flowering	N/A	Presence	N/A	N/A	Presence	N/A	Presence	Presence	N/A	N/A	Presence	N/A	Presence	N/A	N/A	Presence	N/A
Seagrass shoot/leaf length	N/A	Leaf length	N/A	N/A	Leaf length	N/A	Leaf length	Leaf length	N/A	N/A	Leaf length	N/A	Leaf length	N/A	N/A	Leaf length	N/A
Epiphyte abundance	N/A	Cover/ scores	N/A	N/A	Scores	N/A	Cover/ scores	Scores	Scores	Cover	Cover/ scores	Cover	Cover/ scores	N/A	N/A	Scores	Scores
Eggs	N/A	Presence	N/A	N/A	Presence	N/A	Presence	Presence	N/A	N/A	Presence	N/A	Presence	N/A	N/A	Presence	N/A
Disease / infection	N/A	Scores	N/A	N/A	Scores	N/A	Scores	Scores	Scores	N/A	Scores	N/A	Scores	N/A	N/A	Scores	Scores
Algae abundance	% green, % red/brown	% cover	N/A	N/A	% cover	% green, % red/ brown	% cover	% cover	% green, %red/ brown	% green, % red/ brown	% cover	% green, % red/ brown	% cover	N/A	N/A	% cover	% green, %red/ brown
Kelp abundance	%	N/A	N/A	N/A	N/A	%	N/A	N/A	Presence	%	N/A	%	N/A	N/A	N/A	N/A	Presence

Site name	Yarmouth					Mouth of Beaulieu River				Cowes		Osborne Bay					
Survey year	**2018**	**2021**	**2022**	**2023**	**2024**	**2018**	**2021**	**2024a**	**2024b**	**2020**	**2021**	**2020**	**2021**	**2022**	**2023**	**2024a**	**2024b**
Non-native species	% *Sargassum muticum*	Noted	N/A	N/A	Noted	% *Sargassum muticum*	Noted	Noted	% *Sargassum muticum*	% and noted	None noted	% and noted	Noted	N/A	N/A	Noted	% *Sargassum muticum*
Bare sediment cover	%	N/A	N/A	N/A	N/A	%	N/A	N/A	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	%
Substrate type/ composition	Types	Types	N/A	N/A	Types	Types	Types	Types	Types	Types	Types	Types	Types	N/A	N/A	Types	Types
Anthropogenic impacts	Anchor scars	Signs of anchor scars and sediment disturbance	N/A	N/A	Noted	Anchor scars	No signs	Noted	Exposed roots, litter noted	Noted, especially litter	No signs	Evidence of potting and mooring	No signs	N/A	N/A	Noted	Exposed roots, litter noted
Recreational activity survey	No	Yes	Yes	Yes	Yes*	N/A	N/A	N/A	N/A	N/A	N/A	No	Yes	Yes	Yes	Yes*	N/A
Comments	Notes on visibility, epiphytes	Presence of any seahorses noted	N/A	Walkover intertidal survey this year unsuccessful	Notable species recorded and observations on seagrass condition made	Made on visibility	Presence of any seahorses noted	Notable species recorded and observations on seagrass condition made. Walkover intertidal survey in previous year (2023) unsuccessful	Non-native species and species of conservation interest noted	Poor visibility, images not captured on edge of bed, large gaps between quadrats	Presence of any seahorses noted	Some poor visibility, survey indicates that seagrass may extend east into Wootton Creek	Presence of any seahorses noted	N/A	N/A	Notable species recorded and observations on seagrass condition made	N/A

3.3 Analysis of the ReMEDIES data

The ReMEDIES data were reviewed across all sites in the Solent to establish if there are any temporal trends for the period 2018 to 2024.

3.3.1 Seagrass extent

Figure 3 compares seagrass meadow extent (in hectares) over time for all the Solent sites (i.e. ReMEDIES sites and additional sites, where data were available) that had at least two comparable surveys.

Generally, the extent of seagrass beds has increased slightly over the last decade, although this may be due to improved survey techniques and/or conditions on the day of survey (e.g. greater visibility). These surveys were conducted in the intertidal seagrass meadows, with the exception of the data collected in Cowes, which were from subtidal meadows.

The seagrass meadows in Chichester Harbour, show habitat expansion and support some relatively large beds. Mill Rithe on the east of Hayling Island in Chichester Harbour stands out with the largest seagrass meadow out of the selected sites. This meadow measured 52.1 ha in 2013 and increased to 59.9 ha in 2023 (data sourced from Perry, 2024).

The sites of Crake Rithe and Horse Pond to East Head, in Chichester Harbour, both show modest increases in extent (data sourced from Perry 2024). Past efforts to manage seagrass meadows at this site, such as the prohibition of fishing in 2013, may have contributed to the slight increase in the size of the beds over the last 10 years.

For the sites on the Isle of Wight (Cowes and Gurnard Bay), the trends are inconclusive (Figure 3). The relatively large meadow at Cowes has seemingly maintained a consistent extent of approximately 12.15 hectares between 2006 and 2021, which is before any active intervention by the ReMEDIES project in 2022 (data sourced from Kenworthy, 2021 and GIS data analysis for 2021).

At Gurnard Bay, some variability in seagrass bed size can be observed increasing from 0.36 ha in 2010 to 0.84 ha in 2023. This site has not been subject to any direct interventions through the ReMEDIES project.

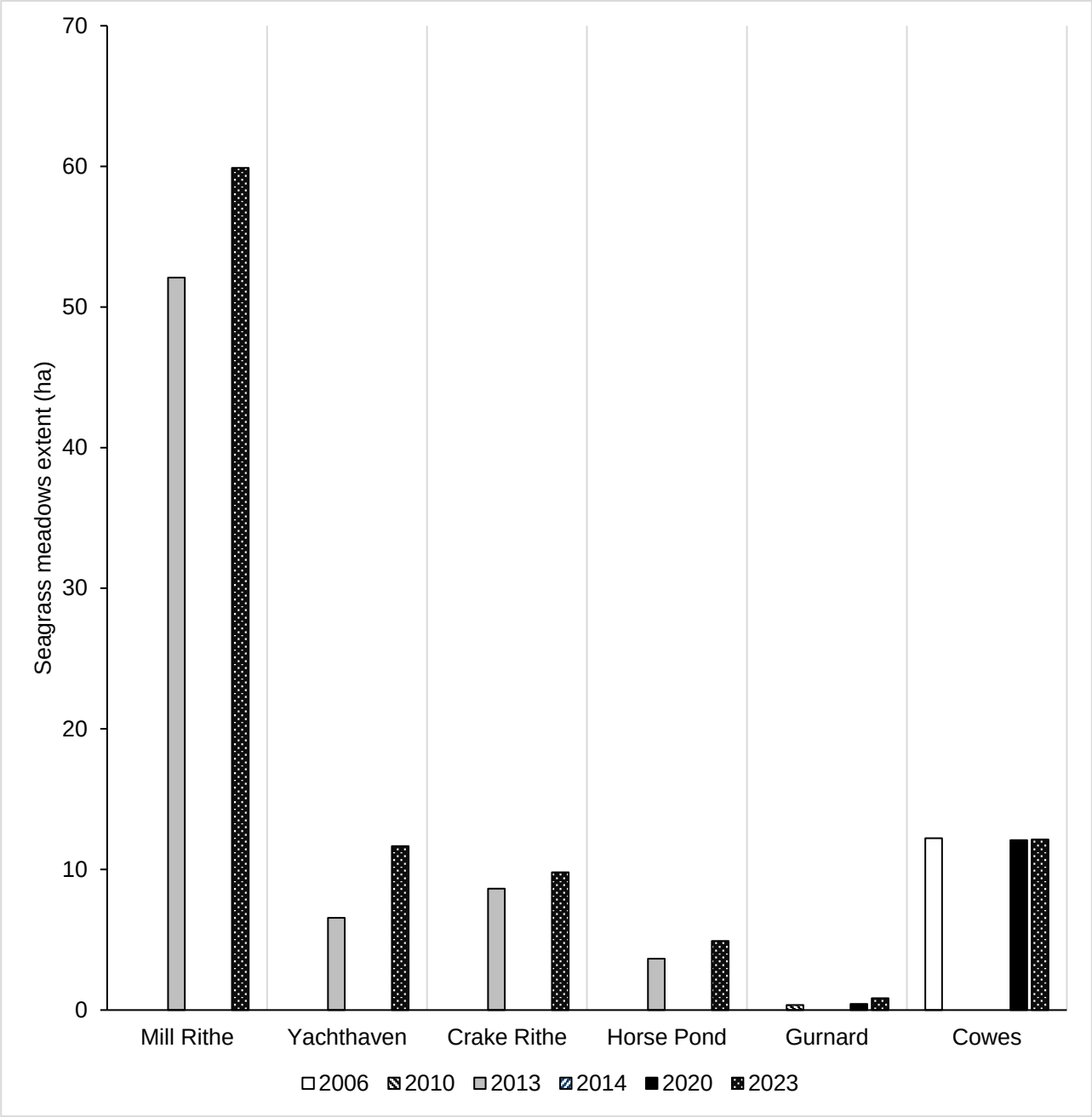

Figure 3: Seagrass meadow extent (in hectares) over time at six Solent Maritime SAC sites.

3.3.2 Seagrass cover

Figure 4 shows the average seagrass cover (in %) for each comparable site that was surveyed for two years or more. Each of these sites have received ReMEDIES interventions and the data comparison is for subtidal seagrass meadows. At the mouth of the Beaulieu River, seagrass cover appears to have remained relatively consistent between 2011 and 2021, with minor fluctuations between surveys. However, since 2018, percentage cover has declined progressively from 42% in 2018 to 35% in 2024 (data sourced from Kenworthy for the surveys made in 2011, 2018 and 2021 while the 2024 data was extracted from the GIS data). Seagrass cover at Cowes has remained high

(approximately 73%) between 2018 and 2020, with no notable differences between years (data sourced from Doggett and Northen 2024, and Kenworthy 2021).

At Osborne Bay, cover was high in 2020, being measured at 68%; however, subsequent surveys indicate a sharp decline with cover in 2021 recorded at 55% and then only 21% in 2024 (data was extrapolated from the GIS data for the years 2020 and 2024, while the data for 2021 was sourced from Doggett and Northen 2024). A similar trend is apparent at Yarmouth with a decline of seagrass cover from 78% in 2018 to 41% in 2024 (data sourced from Doggett and Northen 2024 for the years 2020 and 2021, while the data for 2024 was extracted from GIS analysis) (Figure 4).

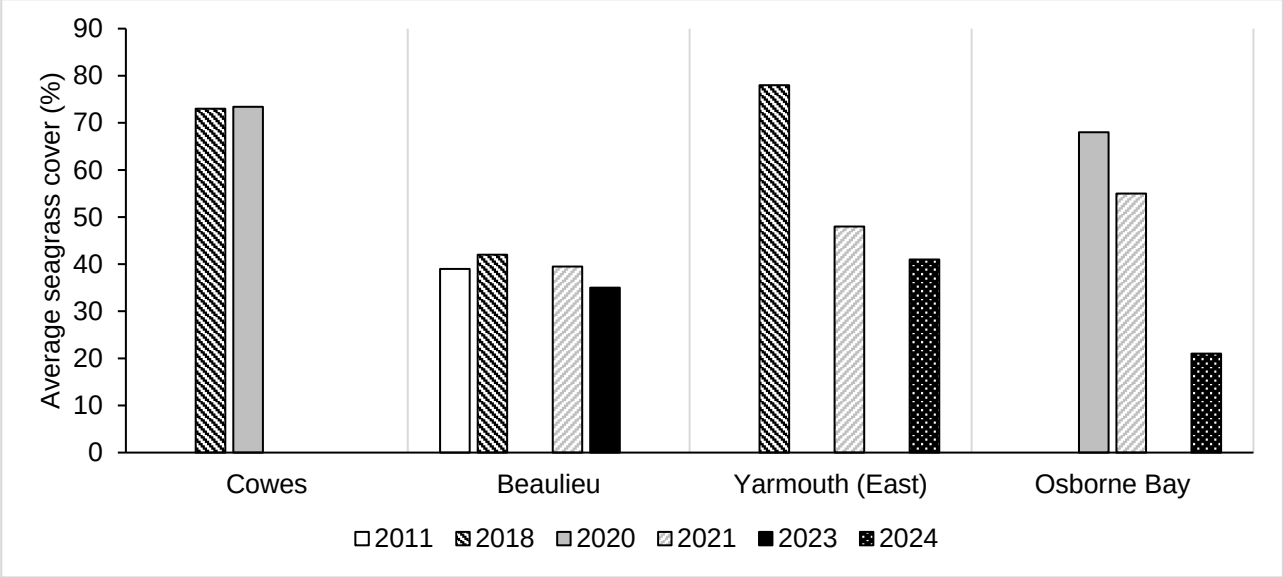

Figure 4: Seagrass cover over time for four sites. Beaulieu refers to Mouth of the Beaulieu River.

Overall, the results show a decline in seagrass percentage cover across sites (Figure 4), irrespective of ReMEDIES interventions. This trend of decreasing cover is most obvious during recent years, especially 2024. The Cowes site appears to be an exception, as it shows abundant cover, but the most recent data suitable for inclusion in this analysis is from 2020. Declining cover could indicate environmental stress, anthropogenic impact, or other ecological factors affecting seagrass meadow extent, despite the recent and ongoing measures for seagrass restoration and management.

3.3.3 Seagrass leaf length

Measures of leaf length can indicate seagrass condition, with longer leaves suggesting healthier plants. Data were extrapolated from the subtidal GIS information made available to this study and were collected during the same months (June and July) for both years compared. At two of the four sites with ReMEDIES interventions, namely the mouth of the Beaulieu River and Osborne Bay, there is evidence of a decline in maximum leaf length between 2021 and 2024 (Figure 5). At the mouth of the Beaulieu River, the median leaf length was around 35cm in 2021 compared to 26cm in 2024. At Osborne Bay, the median leaf length in 2021 is around 30cm and 23cm in 2024. The Yarmouth site shows little change (from a median of 28cm in 2021 to 29cm in 2024) while the site at Cowes only has suitable survey data for 2021 and supports plants with variable but relatively long leaves

(median 40cm). Data are less variable in 2024 than in 2021, possibly due to generally shorter leaves, but more likely a function of many fewer samples being taken (*n*= 572 in 2021, *n*= 26 in 2024). The shorter leaves could indicate stressful or changed environmental conditions, such as reduced light availability, nutrient changes, or disturbances limiting seagrass growth. The reduced variability in 2024 may indicate more uniform environmental conditions, and these conditions may not be favourable for seagrass growth and production.

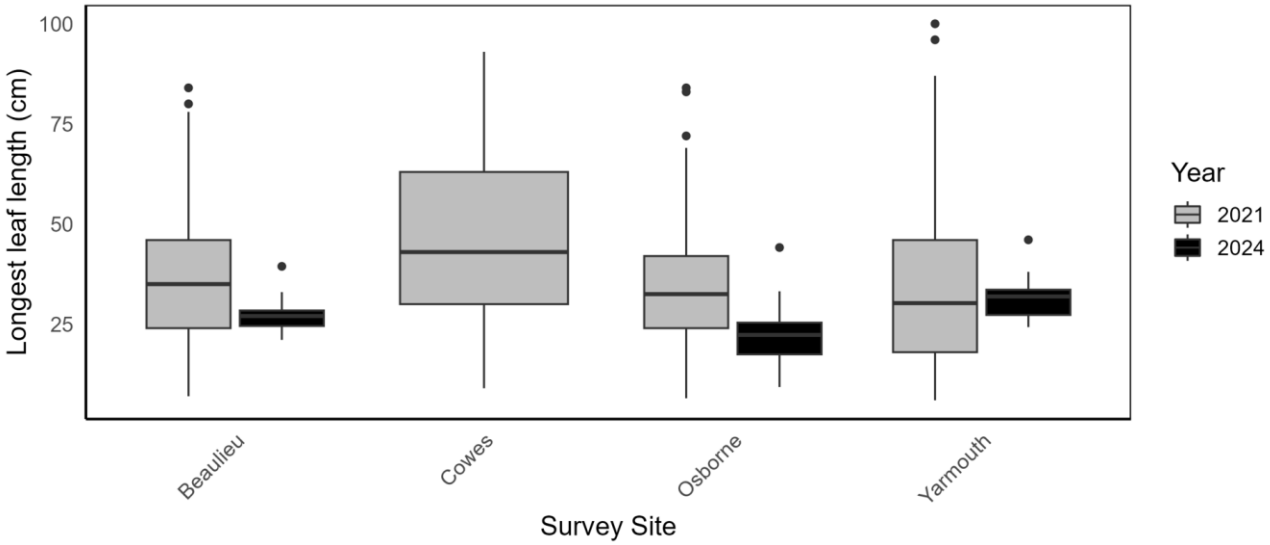

Figure 5: Seagrass longest leaf length (in cm) at four sites in 2021 and 2024. Beaulieu refers to Mouth of the Beaulieu River; Osborne refers to Osborne Bay.

3.3.4 Algae cover

Algae are an essential component of marine ecosystems, but abundance can indicate excessive nutrient input (eutrophication) or other water quality issues. The algae % cover data were extracted from the subtidal GIS information made available to this study. Most algae recorded in the ReMEDIES project library refer to green or red/brown macroalgae and across four sites there is no clear trend of change in abundance in recent years (Figure 6). Instead, there are site-based differences in cover. At the mouth of the Beaulieu River, median of algae cover has slightly increased from 15% to 19% between 2021 (*n*=50) and 2024 (*n*=26). At Osborne Bay, algae cover had a median of around 15% in 2021 and 2024 (*n*=50 in both years) but there was much greater variability in the later year. Algae cover at Yarmouth decreased substantially from 2021 to 2024, with median values of 26% (*n*=50) declining to 7% (*n*=61), and much more variability in 2021 compared to 2024. At the Cowes site, only data from 2021 were suitable for analysis and this shows a very low median cover (<1%, *n*=17).

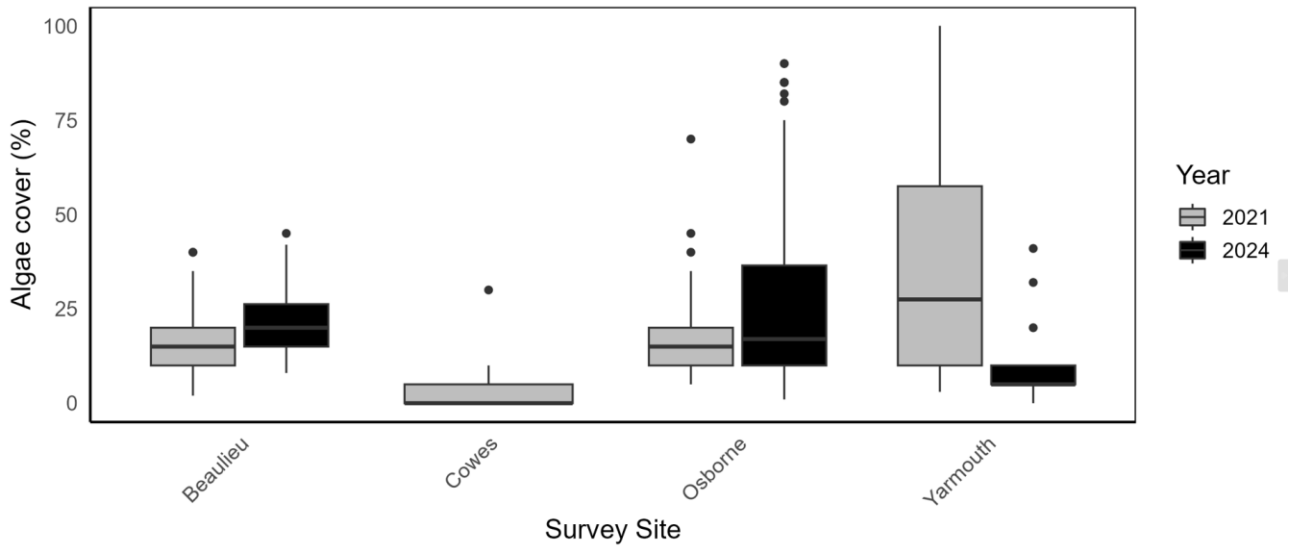

Figure 6: Algal cover at four sites in 2021 and 2024. Beaulieu refers to Mouth of the Beaulieu River; Osborne refers to Osborne Bay.

3.3.5 Infection scores

Seagrass health and condition can be negatively affected by disease, so some surveys incorporated observations of the severity of infection on seagrass leaves. An index of the extent of infection used scores from 0 (uninfected) to 5 (almost all the leaf infected). The data used to represent the infection scores were extracted from the subtidal GIS information.

Figure 7 shows the infection scores across four sites for the years 2021 and 2024. These results should be interpreted with caution as count totals were dissimilar between years but the proportions and range of scores indicate some differences between sites and years. Additionally, the timing of these surveys may be important, as diseases typically spread more during warmer conditions (summer) than during colder ones (winter). Thus, despite both surveys being conducted at similar periods, i.e. late spring in 2021 and early summer in 2024, interannual variations in weather conditions may have impacted infection rates. At the mouth of the Beaulieu River, scores in 2021 mostly ranged between 0-2 indicating uninfected or mildly infected seagrass. In 2024, scores were more variable but mostly spanned 0-3 and there was a slightly greater proportion of counts indicating more severe infection (3-5). Scores showed a similar range for both years at Yarmouth with most being 0 (uninfected), but there were more severely infected leaves in 2024 (scoring 4-5). Most seagrass at Osborne Bay was uninfected or lightly infected (0-1) in 2021 and 2024 but there was a slightly higher proportion of moderately infected leaves (2-3) in 2024. At Cowes, the relatively few counts available for 2021 indicated uninfected or mildly infected plants (0-2). Thus, overall, most seagrass at the four sites were uninfected or showed reasonably low-moderate levels of infection, but there is some indication that more severe levels of infection increased between 2021 and 2024.

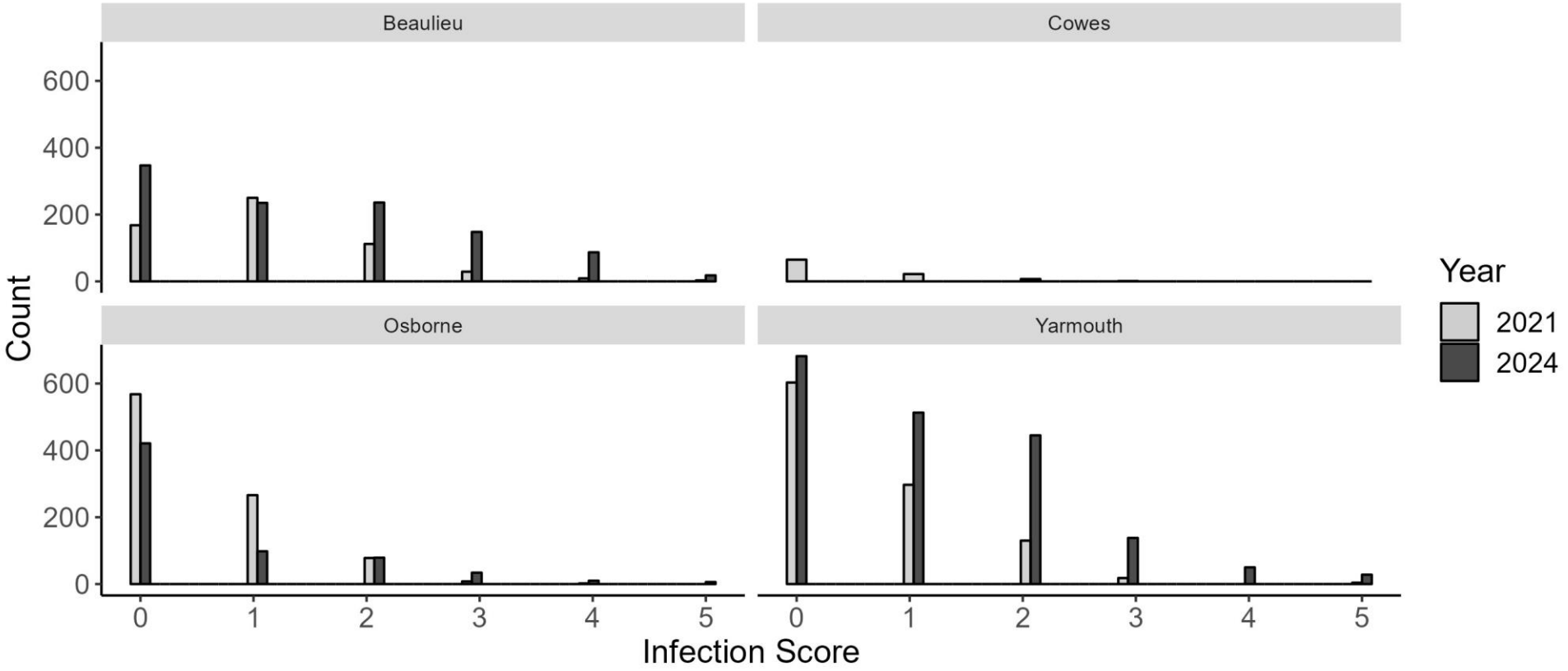

Figure 7: Seagrass infection scores for four sites in 2021 and 2024. A score of 0 = seagrass leaves are uninfected, 1 = minimal infection, 2 = up to a quarter of the leaf infected, 3 = up to half the leaf infected, 4= over half of the leaf infected, and 5 = almost all the leaf infected. The values shown are based on the median of all the individual scores made for each quadrat at each site. Beaulieu refers to Mouth of the Beaulieu River; Osborne refers to Osborne Bay.

3.3.6 Recreational Activity

In addition to the range of biological monitoring surveys delivered through the ReMEDIES project, it supported annual surveys of recreational activity at five seagrass sites to monitor stakeholder and public behaviour (Table 1). The data from 2021-2023 are analysed below and, together with a report by Lee (2018) on recreational anchoring and mooring in marine areas, provide valuable insights into the trends in recreational activities. The key findings from the 2018 report were:

- The Solent hosts a substantial number of recreational anchoring and mooring locations. Specifically, 59 anchorage and 203 mooring areas were identified, which underlined the Solent's importance for leisure boating and water-based activities.
- The high level of recreational activity in the area is reflected in the 'RYA UK Coastal Atlas of Recreational Boating,' which lists 136 RYA Affiliated Clubs, including 48 that are RYA Recognised Training Centres. Additionally, 184 RYA Training Centres are registered, offering a wide range of water sports programs. Finally, the area also features 69 marinas and boatyards.
- The coincidence of anchoring locations with habitats classed as at high risk within the Solent Maritime SAC. The report identified Osborne Bay, Newtown Bay, the Medina River (upstream into the estuary), Bosham and West Wittering as having a high anchoring intensity, while Thorness Bay and Cowes (both sites on the Isle of Wight), and Tye Bay at Northeast Hayling Island, and Fowley Island (both in Chichester Harbour), with medium anchoring intensity.
- Anchoring was regulated, with specific areas designated for recreational vessels, particularly in sensitive environmental zones like MPAs (Marine Protected Areas).
- Anchoring activities cover a wide range of practices, and as a result no strong temporal or seasonal usage pattern was captured by the report, though generally, boating activities peaked from April to September ("boating season").
- Mooring activities (pontoon berths and swinging moorings) did not display strong seasonality patterns, however, were most heavily used during the boating season.

The general trend for recreational activities across the survey sites in the Solent shows that boating activities have increased since 2018, with a rise in the combined total number of vessels across the five sites from 2021 to 2023, averaging 117.7 counts per hour and 120.3 counts per hour, respectively (Figure 8). This increase in vessel numbers is spread across various types of boats, for example RIBs, motor yachts, and day boats with cabins. It is worth noting that boating activities rose in 2022 compared to both 2021 and 2023, which may be the result of lifted COVID-19 restrictions. Mooring and anchoring activities were also on the rise, but not in direct proportion to the increase in vessel numbers (Ferrero, 2022, 2023, 2024).

The combined total number of vessels across the five sites travelling outside the seagrass zone has remained stable, except in 2022 (Figure 8). The number of vessels moored outside the seagrass zone has shown only a slight increase over time. The average number of vessels travelling inside the seagrass zone has steadily decreased, going from an average of 13 to an average of 11.3 per hour, despite the increase in total vessel numbers observed in 2022 (Figure 8). The number of vessels anchoring outside the seagrass zone has remained relatively stable over time, at around 18.5 counts per hour

(Figure 8). Similarly, the number of vessels anchoring or mooring inside the seagrass zones has remained consistent, at approximately 7.6 and 4.2 counts per hour, respectively (Figure 8). Ferry activities have remained fairly stable, with a slight increase from an average of 2 counts per hour in 2021 to 2.5 counts per hour in 2023 (Figure 8). Beach recreation has also remained steady throughout the survey period, averaging around 10 observations per hour (Figure 8). Dog walking has decreased, from an average of 12.1 counts per hour in 2021 to 10 in 2023 (Figure 8). Water sports activities, as a whole, have shown a slight increase over the course of the surveys.

While the overall results across the survey sites show rather modest changes, these mask some site-based differences. Yarmouth and Osborne Bay experience much larger amounts of vessel traffic than the other survey sites, hence the implementation of anchoring and mooring management schemes through the ReMEDIES project at these intensively used sites.

At Yarmouth, the total number of vessels, the number of vessels outside seagrass zones, the number of yachts (both small and large), beach recreational activities, anchoring and mooring, the number of vessels moored outside seagrass zones, the number of RIBs, motor yachts, boats with cabins, dog walkers, vessels travelling inside seagrass zones, and water sports generally increased from 2021 to 2022 then decreased in 2023 (Figure 9). The increase in 2022 seems to be timed with the lifting of COVID-19 restrictions while decreased activity at Yarmouth could be the result of the ReMEDIES project’s efforts to manage mooring and anchoring, as well as engage with stakeholders and local communities, since 2020.

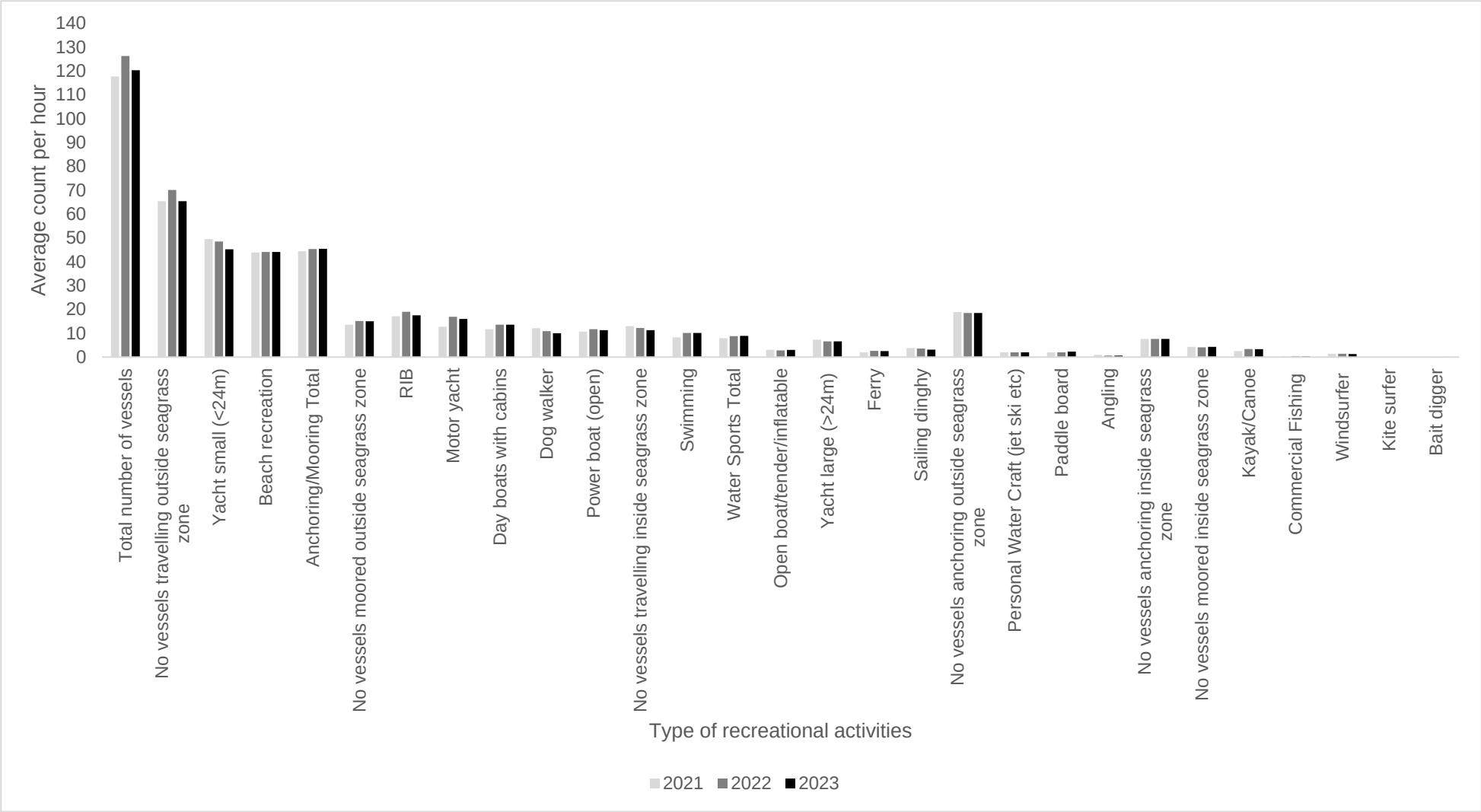

Figure 8: Summary of recreational use for 2021-23 combining five surveyed sites in the Solent. The sites are Yarmouth West (Isle of Wight), Bouldnor (Isle of Wight), Osborne Bay (Isle of Wight), King's Quay (Isle of Wight), and Langstone Harbour.

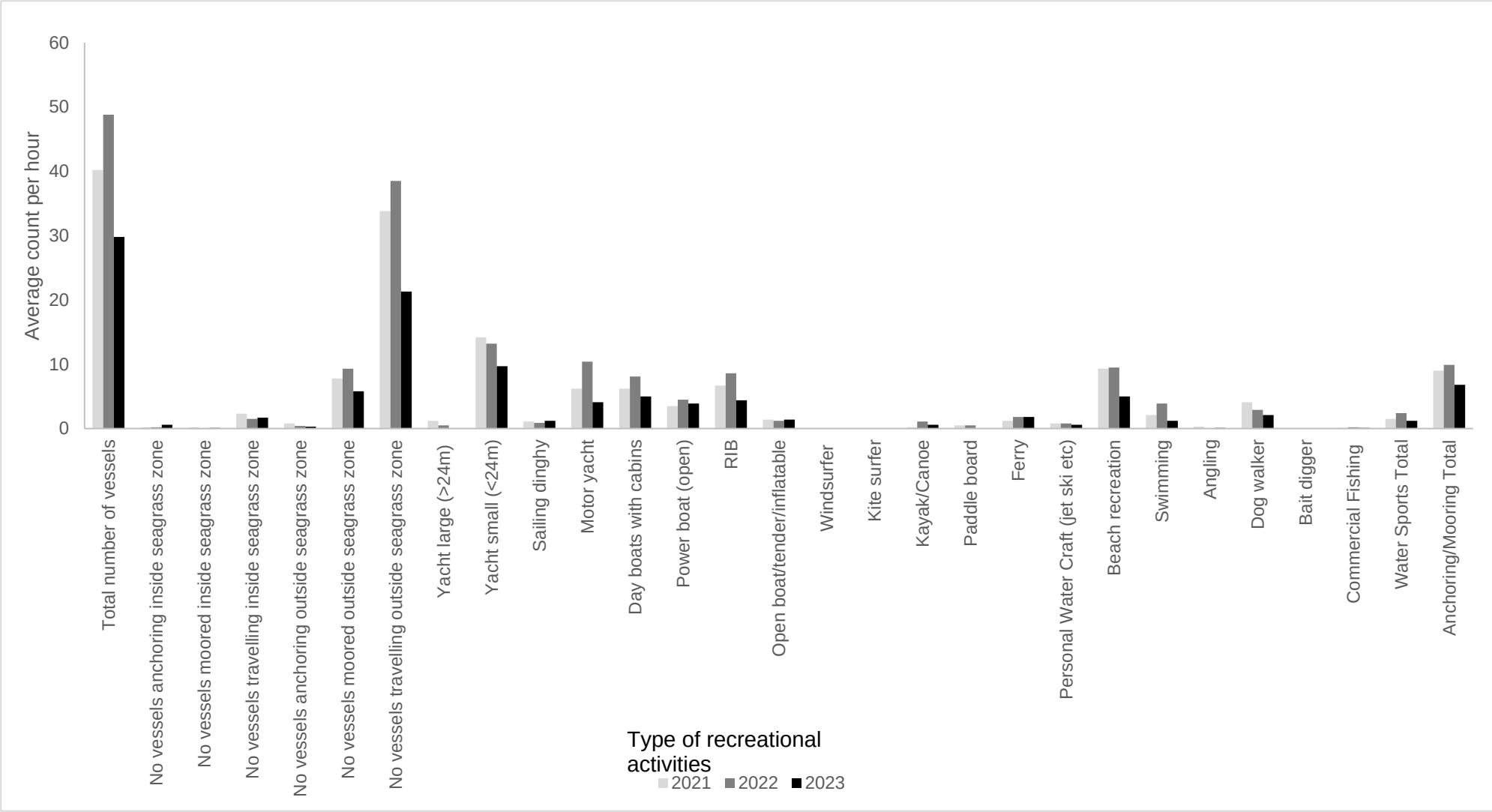

Figure 9: Recreational use of the Yarmouth site during the 2021 to 2023 survey period.

Bouldnor has low levels of boating activities (Figure 10), with a total number of about 15 vessels per hour counted in 2021. There was a decrease in vessels inside and outside the seagrass zone between 2021 and 2022 followed by an increase between 2022 and 2023, bringing the levels nearly back to those of 2021. The number of boats mooring or anchoring inside seagrass areas is consistently very low throughout the survey period (<1 count per hour, and no mooring was observed inside seagrass areas in 2023), while the total amount of anchoring/mooring remains stable (approximately 1 count per hour). This would suggest little impact on seagrass meadows. The only type of ReMEDIES actions that might influence people at Bouldnor are via public and stakeholder engagements, which may have contributed to these low levels of use.

Osborne Bay is a busy site for various water-based recreational activities and received ReMEDIES project interventions to manage mooring and anchorage in March 2024. The total number of vessels in Osborne Bay is comparable to that in Yarmouth, with over 40 observations per hour (Figure 11). However, beach recreational use in Osborne Bay is higher than in Yarmouth, with around 30 or more counts per hour compared to less than 10. The total number of vessels observed at Osborne Bay between 2021 and 2023 remained stable, averaging 41.5 vessels per day (Figure 11). However, some boating-related activities showed a rise in 2022 compared to 2021. For instance, the number of vessels anchoring inside seagrass zones increased from 5.3 to 8.5 counts per hour, with similar observations for vessels moored inside these areas. The number of vessels traveling inside seagrass areas increased from 3.6 in 2021 to 8.2 per day in 2022. RIBs and motor yachts also peaked in 2022. Over the three-year survey period, anchoring inside the seagrass area continued to increase, and a similar trend was observed for small yachts and open boats/inflatables. Beach recreational use also soared in 2023 (Figure 11). From 2021 to 2023, the number of vessels traveling inside the seagrass zone, dinghies and inflatables, power boats, paddleboarding, and other water sports increased. These observations generally suggest an increase of pressures created from small vessels and water sports at this site, but not for larger vessels. However, almost no mooring inside seagrass zones has been observed during the survey period.

King’s Quay (just along the coast from Osborne Bay) is a low-traffic area, likely due to its relative remoteness. However, boating numbers have increased over time, with the total number of vessels observed rising from around 3.6 counts per hour in 2021 to 11.1 in 2022, and 15.9 in 2023 (Figure 12). In 2022 a rise in counts across most of the surveyed activities was recorded. Overall, most activities have increased between 2021 and 2023, including the number of vessels anchoring inside seagrass areas, despite no mooring being observed there. The number of vessels travelling inside the seagrass zone has decreased between 2021 and 2023, but there was a very large increase outside this zone (Figure 12). This difference may be an effect of the ReMEDIES stakeholder and community engagement programme, which may have encouraged people to avoid seagrass meadows.

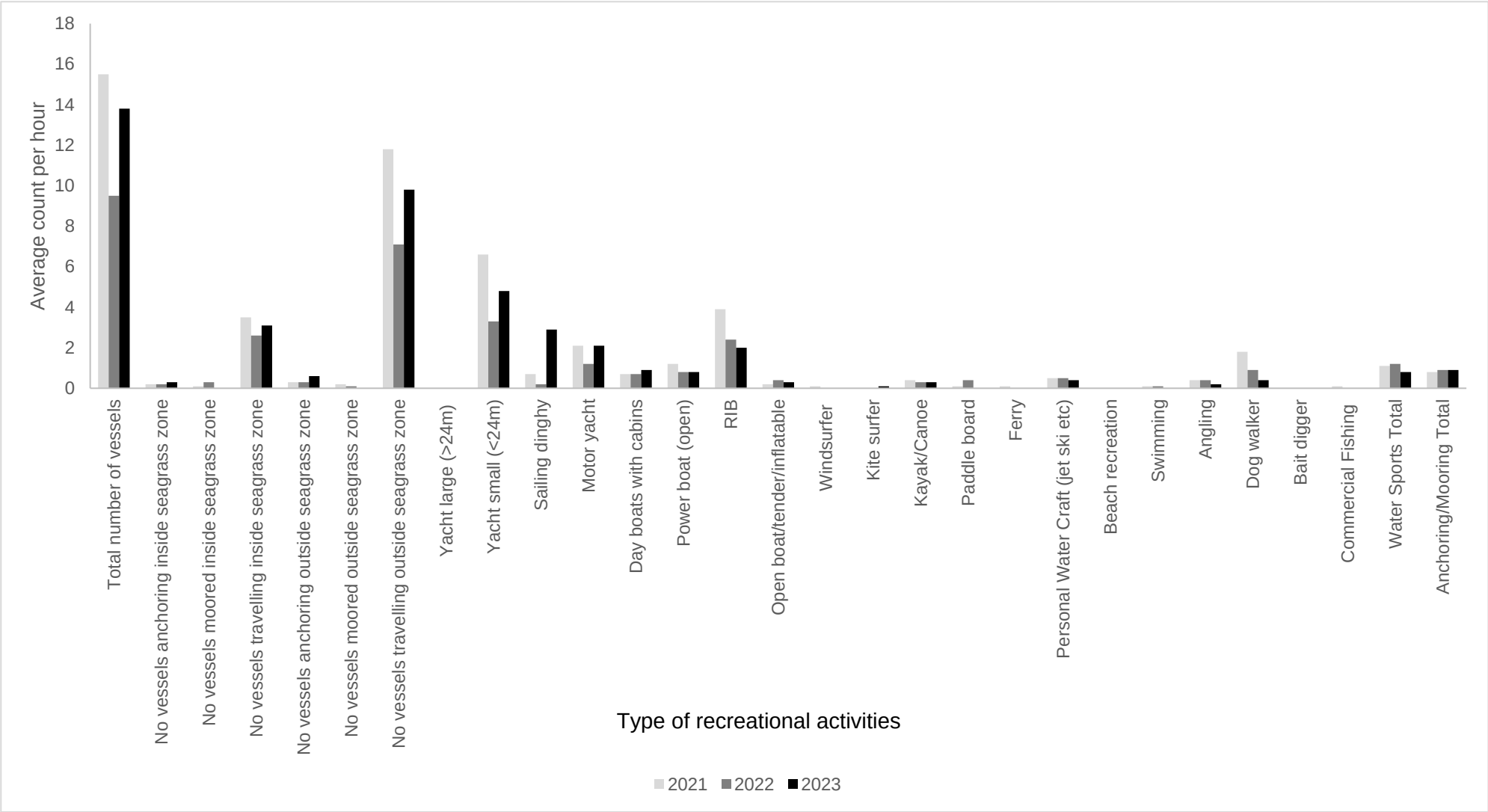

Figure 10: Recreational use of the Bouldnor site during the 2021 to 2023 survey period.

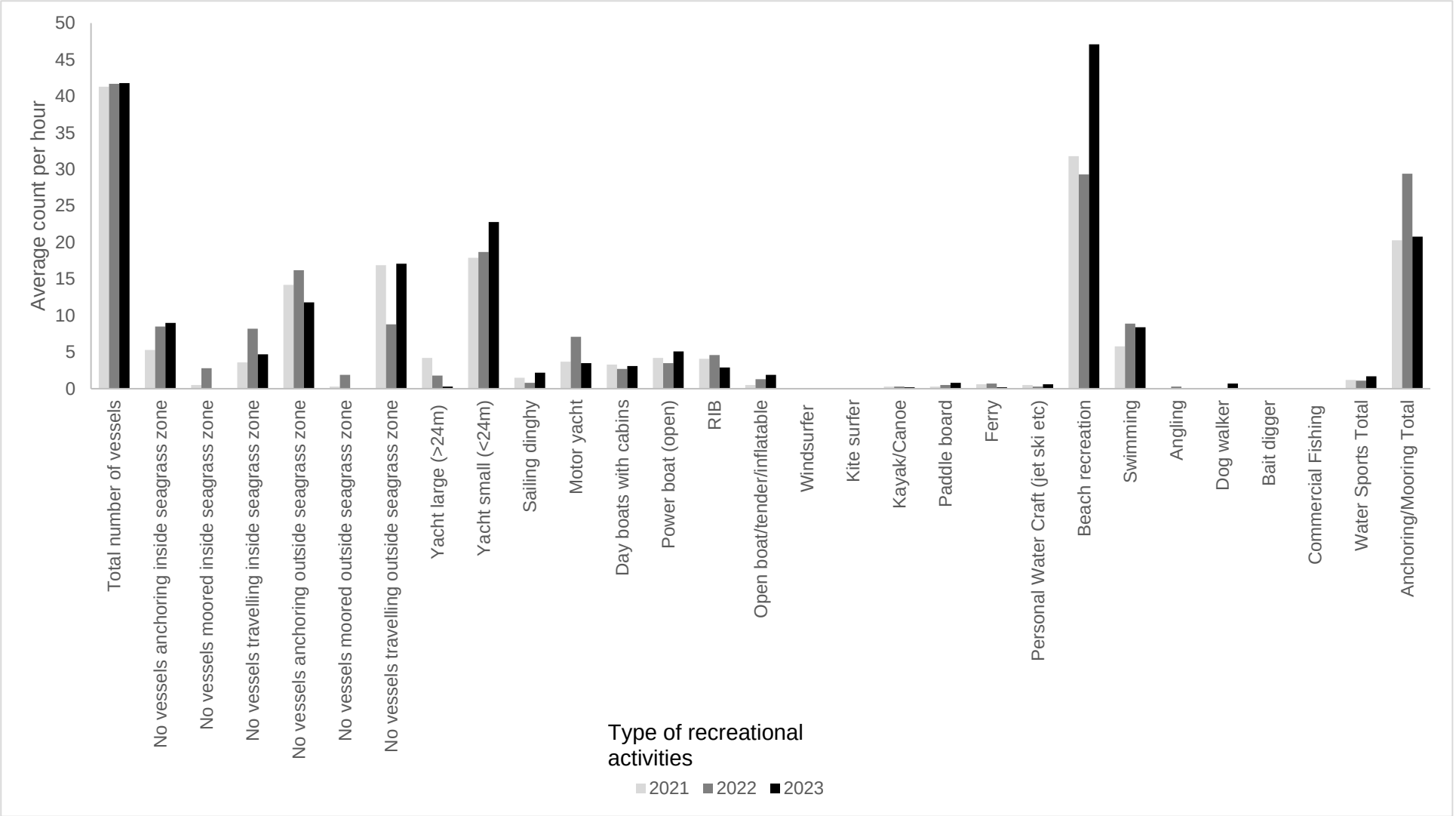

Figure 11: Recreational use of the Osborne Bay site during the 2021 to 2023 survey period.

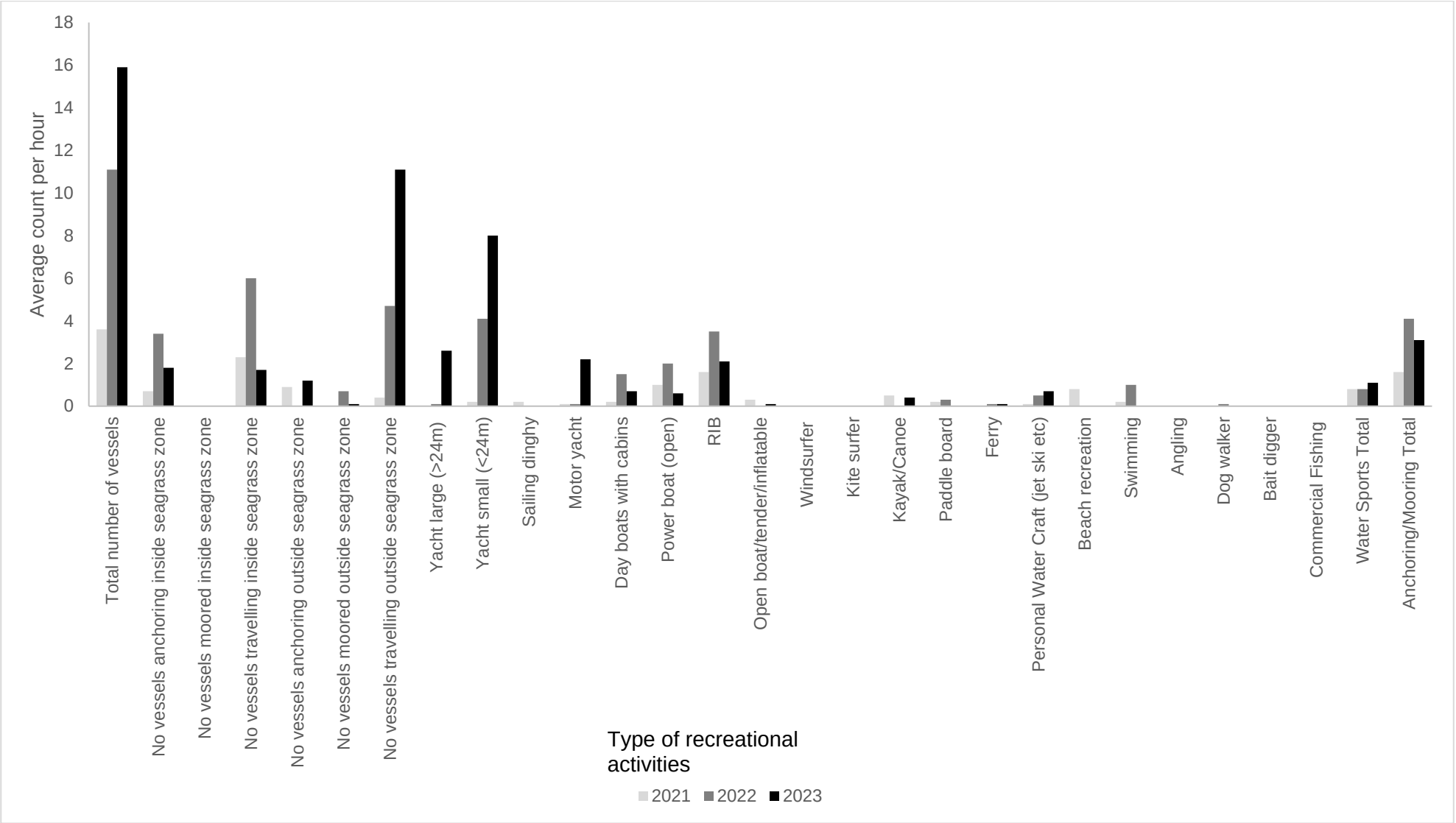

Figure 12: Recreational use of the King's Quay site during the 2021 to 2023 survey period.

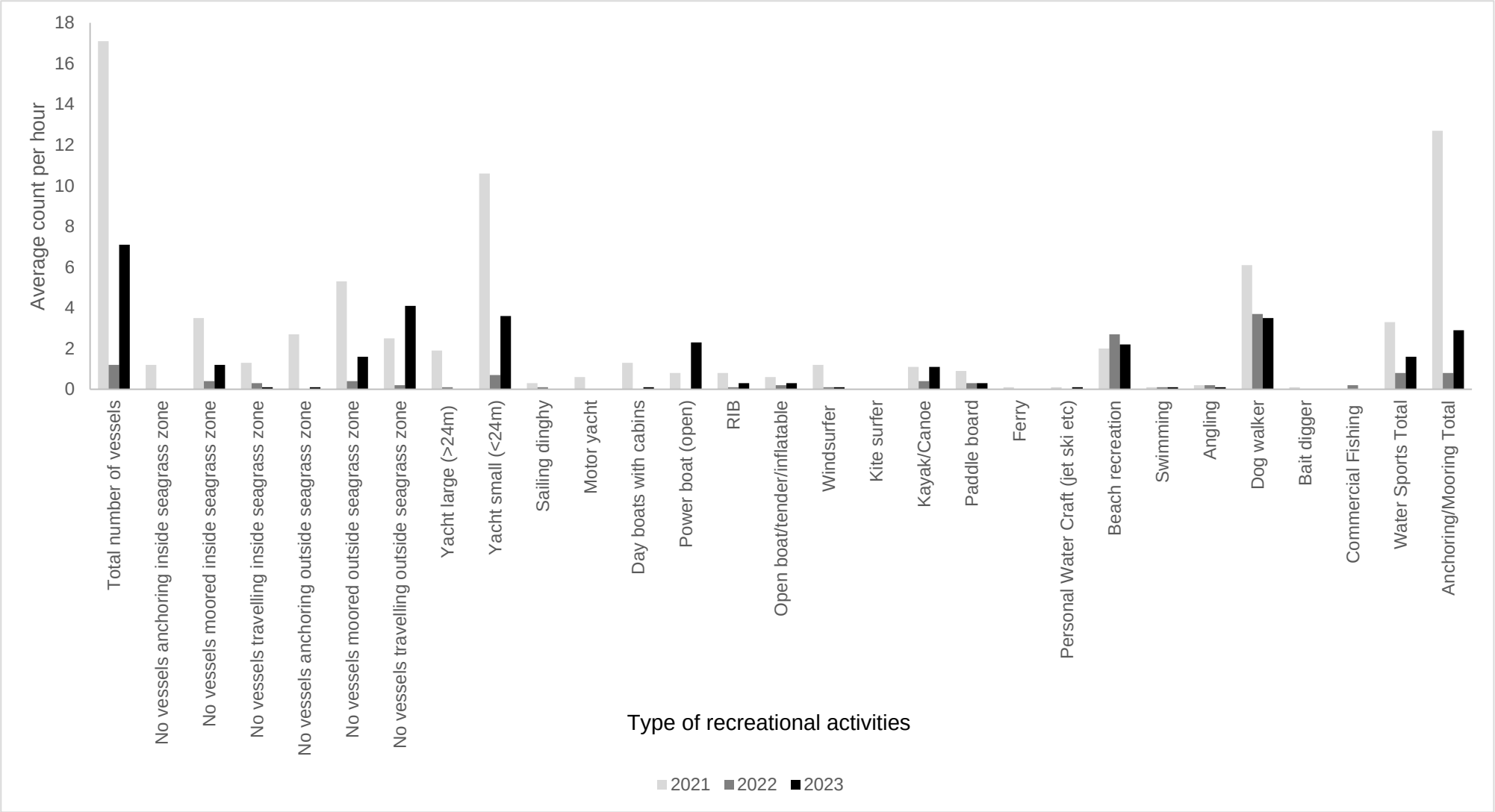

Figure 13: Recreational use of the Langstone Harbour site during the 2021 to 2023 survey period.

Langstone Harbour is another example of a less busy recreational site compared to Yarmouth and Osborne Bay, with fewer than an average of 20 vessels observed per hour (Figure 13). The site shows large fluctuations with a lot of activity in 2021, and less after. In particular, there was a sharp decrease in recreational activities in 2022, except for beach use, which increased that year.

Overall, from 2021 to 2023, recreational use of this location by most types of boats decreased, except for power boats, which increased (Figure 13). During this period, the number of vessels traveling outside seagrass areas rose from 2.5 to 4.1 counts per hour, while the numbers of vessels mooring, anchoring, and traveling inside seagrass zones declined (no anchoring being observed in 2022 and 2023). The total number of water sports activities also dropped from 3.3 counts per hour in 2021 to 1.6 in 2023. Additionally, the number of dog walkers decreased from 6.1 counts per hour in 2021 to 3.5 in 2023, while beach recreational users remained stable, around 2.1 counts per hour (Figure 13).

3.4 Reporting to inform condition and potential drivers of change

The focus of the ReMEDIES project was on a range of interventions to improve condition of seagrass meadows in the Solent Maritime SAC (and elsewhere). Based on the analysis of data in the project library, some indications of seagrass condition and changes in recent years can be inferred.

3.4.1 Seagrass condition

Indications of seagrass condition, with reference to the most relevant habitat attributes (Natural England, 2018, 2019), suggest that:

- The size of the surveyed seagrass meadows in the Solent has generally increased, possibly due to better surveys, and there is no strong evidence of a decrease in seagrass extent (habitat attribute 1.01 Extent and distribution).
- On the Isle of Wight, the cover of seagrass within beds at Osborne Bay, Yarmouth and Gurnard has declined in recent years, while it has remained stable at Cowes (3.14 Structure: biomass).
- Seagrass leaf length, which can be an indicator of health and productivity, has decreased at the mouth of the Beaulieu River and Osborne Bay, and changed little at Yarmouth (3.14 Structure: biomass).
- Seagrass infection seems to be becoming more severe at the mouth of the Beaulieu River, Yarmouth, and Osborne Bay (3.09 Structure: non-native species and pathogens).
- There is no clear trend in the abundance of algae across seagrass sites, suggesting algae are not related to seagrass changes and environmental stresses may not be substantially influencing the ecosystem more generally (6.04 Supporting processes: water quality – nutrients). However, it is important to note that the focus of the survey effort was for subtidal seagrass beds primarily along the open coast, which would be less likely to be impacted by nutrients.

There are, therefore, positive, and inconclusive indicators of seagrass condition at sites in the Solent but also concerning signs of deteriorating seagrass condition. On balance, indicators suggest it is likely that seagrasses continue to suffer from unfavourable pressures driving change in the Solent. Overall, this analysis of data on seagrass at ReMEDIES sites within the Solent Maritime SAC will be used to inform a future condition assessment by Natural England.

3.4.2 Drivers of change

Evidence of factors driving any changes in seagrass condition is not strong due to quantitative data constraints, but some trends and differences ascertained from the results of this study may indicate potential effects.

- **Disturbance from recreation:** The Solent is intensively used for military, commercial and recreational activities. This study has shown that some seagrass sites represent recreational hotspots, such as Yarmouth and Osborne Bay on the Isle of Wight. The results of the recreational activity surveys indicate that activities have been generally stable or shown a slight increase across the Solent sites since 2018, but that small vessels and water sports have increased at Osborne Bay. There are also annual fluctuations at the site level. Subtidal surveys have observed disturbance and/or damage to seagrass from anchoring, mooring, potting and/or litter at Yarmouth, the mouth of the Beaulieu River, Cowes, and Osborne Bay. Such disturbance and/or damage may have contributed to the loss of seagrass cover in some beds.

- **Visibility/turbidity:** Qualitative observations of poor visibility were made for subtidal surveys at Yarmouth, the mouth of the Beaulieu River, Cowes, and Osborne Bay. Turbid waters may be a result of human impacts, such as pollution or erosion, or may be a natural occurrence coinciding with particular surveys, e.g. storm events. However, turbid water has the potential to reduce light availability for seagrasses, which may be driving the reductions in leaf length and cover reported in this study. Future monitoring on turbidity would be beneficial to understand the direct impacts and origins of this issue better.

- **Water quality:** Pollution and poor water quality clearly have the potential to negatively affect seagrass condition and may be contributing to the reductions in cover and leaf length found in this study. Although surveyors occasionally observed algal mats during their site visits, which can indicate high nutrient levels, the data revealed no clear trends in algae cover at the Solent sites perhaps because many of the sites were subtidal beds along the open coast. It would be beneficial to consult water quality data to further establish any relationships between water quality and seagrass condition in the Solent.

- **Disease:** Many seagrass populations have been decimated by wasting disease in the UK and it is a potentially serious constraint on seagrass condition. This study suggests that the severity of infection on seagrass plants has increased slightly in

the last few years, which could hamper efforts to restore and conserve seagrass beds.

- **The ReMEDIES project:** The project has implemented actions for restoration and conservation of seagrass beds through seeding of seagrasses, the initiation of less damaging mooring and anchoring systems, and attempts to change stakeholder behaviour to protect seagrass habitat. It was not possible to compare sites with ReMEDIES interventions and those without to distinguish the likely effects of activities on seagrass condition because there was insufficient comparable data for specific variables to provide evidence or reliable results. However, there are some indications that actions have driven change by reducing anchoring and mooring at Yarmouth and encouraging water users to avoid seagrass beds at Osborne Bay through the installation of a Voluntary No Anchor Zone. As many of the interventions have only been applied in the last two years, it is too soon to have confidence that these positive effects will be replicated elsewhere in the Solent and will last, and therefore the ecological implications of ReMEDIES actions may take many years to emerge, highlighting the importance of continued monitoring.

4 Conclusions & recommendations

4.1 Methods summary

This report provides a synthesis of the activities of the LIFE Recreation ReMEDIES project and any observed changes in seagrass from surveys within the Solent Maritime SAC. It summarises the actions taken through the ReMEDIES project to improve the condition of seagrass, reviews the survey and monitoring data and reports available, identifies any effects of the project actions on seagrass habitat, and proposes recommendations to inform the condition of seagrass and potential drivers of change. After a comprehensive review and cataloguing of all available reports and data, the information was organised into coherent sites for data analysis. This partly overcame data limitations, but due to the variable sources of data reliable comparisons between sites and over time using inferential statistics were not possible. However, some important variables were able to be selected and analysed using descriptive statistics to provide robust indicators of seagrass condition and recreational use.

4.2 Key results

The ReMEDIES project in the Solent Maritime SAC has delivered data collection surveys, restoration, and conservation actions for seagrass (e.g. seeding, anchoring, and mooring schemes), and activities designed to educate and change behaviour for seagrass conservation. Data collection through ReMEDIES was focused on subtidal seagrass meadows at the ReMEDIES intervention sites, allowing more reliable comparisons between these areas.

These analyses show that the known extent of seagrass meadows in the Solent has increased slightly, possibly due to better survey techniques. Seagrass density has declined in meadows on the Isle of Wight, especially in the last few years. There has been a decrease in seagrass leaf length at two ReMEDIES sites, which could suggest a declining condition, although this is far from definitive as many factors can influence leaf form. There are generally low to moderate levels of infection on seagrasses at four ReMEDIES sites, but some indications that infection is getting more severe. There is no clear trend in algae cover at ReMEDIES sites, which were primarily subtidal.

Separate to this analysis, additional drop-down video transects, and dive surveys were undertaken at the mouth of the Beaulieu River at the location of the restoration site. These confirmed the presence of new seagrass. However, it is recommended this site is monitored further to ascertain whether this is an early sign of recovery.

The Solent is intensively used for recreation and surveys suggest there has been a slight increase in activity in recent years, possibly related to the easing of COVID-19 restrictions. At the two busiest ReMEDIES sites, Yarmouth and Osborne Bay on the Isle of Wight, boating activity in seagrass zones seems to have decreased recently, possibly due to project activities.

Although there are some positive and inconclusive indicators associated with seagrass meadows in the Solent, there are some signs of declining condition. Drivers for change are unproven due to a lack of suitable quantitative data, but potential candidates forcing negative effects are physical disturbance, poor water visibility and quality, and disease.

Nevertheless, the ReMEDIES project is beginning to demonstrate that actions can lead to positive change as more people seem to be avoiding sensitive seagrass beds following ReMEDIES interventions.

4.3 Recommendations for future monitoring

There are many examples of excellent practice in the data collection and collation implemented through the ReMEDIES project, but there is scope to improve future monitoring of seagrass beds in the Solent. To better understand the impacts of pressures affecting seagrass and provide evidence to support measures to restore and conserve habitats, survey data should be collected in a coordinated, consistent, and comparable methodology. However, it is important to acknowledge that constraints such as capacity, funding, and equipment availability may limit the implementation of the ideal monitoring scenario. Recommendations are to:

- **Develop a data collection protocol -** Establish a clear and systematic data collection protocol and apply it consistently across sites. Standardised scientific survey methodologies, offer the most capacity for robust analysis. Citizen science can also be used to identify changes and alert authorities to significant events. Ensure that data is collected consistently, recording a standard list of characteristics, so that when data is transferred to databases or GIS it can easily be interpreted.

- **Coordinate surveys –** Coordinate subtidal and intertidal surveys, where possible, so they are conducted in a synergistic way. Scheduling visits regularly across various sites, and across different seasons of the year, would build a comprehensive understanding of the health of the seagrass habitat. Both subtidal and intertidal surveys can encounter problems, as evidenced by the data in the ReMEDIES library. For example, poor water visibility may prevent the collection of valuable data underwater. Surveys on foot are time-intensive and can be impeded by incoming tides and deep mud. Additional methods to supplement the existing survey methods, could be effective and provide consistent and additional data collection.
- **Collect data on both seagrass quantity and quality -** Changes in seagrass density provide valuable insights into the health of meadows, but they do not capture the full extent of their expansion or contraction (Natural England, 2023). To better detect these changes, density data should be combined with boundary or area coverage measurements, such as those collected by the Environment Agency in 2018 and 2020 to provide a more statistically robust method for monitoring trends.
- **Use one coordinate system and retain it** - a consistent coordinate system should be used across datasets, such as the World Geodetic System (WGS84) or the British National Grid. Use decimal degrees for values.
- **Use one site naming convention and retain it -** Standardize the naming of sites. A consistent approach, like the one used in this report, could be adopted. The full extent of each site should be clearly defined and surveyed.

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List of Abbreviations

Abbreviation	In full
AMS	Advanced Mooring Systems
EA	Environment Agency
EUNIS	European Nature Information System
GIS	Geographic Information System
Ha	Hectare
HIWWT	Hampshire & Isle of Wight Wildlife Trust
IoW	Isle of Wight
km	Kilometre
LIFE	L'Instrument Financier pour l'Environnement
m^2	Metre squared
MPA	Marine Protected Area
NE	Natural England
PVI	Percentage Volume Inhabited
ReMEDIES	Reducing and Mitigating Erosion and Disturbance Impacts affecting the
RIB	Rigid Inflatable Boat
SAC	Special Area of Conservation
SPA	Special Protection Area
Spp.	Species
SSSI	Site of Special Scientific Interest
VNAZ	Voluntary No Anchor Zone
WGS85	World Geodetic System
%	Percentage

Glossary of terms

Latin Name / Name	Common name / Explanation
Angiosperm	Flowering plant
Aglaothamnion tenuissimum	Bonnemaison / red algae
Amphilectus sp.	Brown algae
Asparagopsis armata	Harpoon weed / red algae
Botrylloides sp.	A genus of Ascidian tunicates, also commonly known as a sea squirts.
Carbon sequestration	A natural (or artificial) process by which carbon dioxide is removed from the atmosphere and stored within the seagrass meadows, specifically within both the plant stems and their sediments and can be stored for long periods of time. Intertidal mudflat or saltmarsh environments are also considered as powerful carbon storage systems.
Crepidula fornicata	A Mollusc, commonly known as a Slipper limpet.
Dasysiphonia japonica	Yendo / red algae
Ectocarpaceae sp.	Brown algae
Kirchenpaueria sp.	Hydroid
Labyrinthula zosterae	Slime mould / Parasitic pathogen that causes wasting disease in seagrasses.
Laomedea angulata	Sea grass or Sea fir
Ramsar	Ramsar sites are wetlands that have been designated as internationally important under the Ramsar Convention - an intergovernmental treaty that aims to conserve wetlands and their resources.

Latin Name / Name	Common name / Explanation
Rhodophysema georgei	A red seaweed that can be found as an epiphyte on eelgrass (*Zostera marina*). It appears as two distinct red lines on the edges of the leaf.
Ruppia sp.	Tasselweed, Wigeonweed, Ditch grass or Wigeongrass
Sargassum muticum	Wireweed
Styla clava	Stalked sea squirt, clubbed tunicate, Asian tunicate, leathery sea squirt, or rough sea squirt.
Zostera.agustifolia	Narrow-leaved eelgrass
Zostera marina	Common eelgrass
Zostera noltii	Dwarf eelgrass
Zostera spp.	Eelgrass species

Appendix A: Data catalogue

Table 3: Data Catalogue - The Kench, West Hayling

Designation	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar
Type of survey	Intertidal/walk over
Year	2023
Species	*Z. noltii, Z. marina* and *Z. marina* ecotype
Approx. size of bed (ha)	4.69
Cover range (%)	1-75
Average cover (%)	39.50
Sediment composition and distribution	Mud and gravel/sand
Non-native species and pathogens	None observed
Water quality (algal growth)	Low abundance of algae present
Anthropogenic pressures	None observed

Table 4: Data Catalogue - West Hayling, Langstone Harbour

Designation	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar
Type of survey	Intertidal	Intertidal/walk over
Date	Previous data (2014)	2023
Species	*Z. noltii* and *Z. agustifolia (Z. marina* ecotype)	*Z. noltii* and *Z. marina*
Approx. size of bed (ha)	76.47	Unknown - unable to survey full extent Area surveyed: 38.58
Cover range (%)	Dense	5-95
Average cover (%)	Not specified	47.95
Sediment composition and distribution	Muddy sand and mud	Mud
Non-native species and pathogens	None observed	None observed
Water quality (algal growth)	Not specified	Algae present
Anthropogenic pressures	None observed	None observed

Table 5: Data Catalogue - Mengham Rithe, East Hayling

Designation	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar
Type of survey	Intertidal	Intertidal/walk over
Date	Previous data (2013)	2023
Species	*Z. noltii* and *Z. agustifolia (Z. marina* ecotype)	*Z. noltii, Z. marina* and *Z. marina* ecotype
Approx. size of bed (ha)	46.5	Unknown - unable to survey full extent Area surveyed: 33.33
Cover range (%)	Dense	10-100
Average cover (%)	Not specified	68.90
Sediment composition and distribution	Muddy sand and mud	Mud, stones and cobbles
Non-native species and pathogens	None observed	None observed
Water quality (algal growth)	Not specified	Algae present
Anthropogenic pressures	Holes in seagrass beds due to dragging mooring chains.	Gauges/dredge marks in mud possibly from boats/equipment being dragged through.

Table 6: Data Catalogue - Mill Rithe, East Hayling

Designation	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar
Type of survey	Intertidal	Intertidal/walk over
Date	Previous data (2013)	2023
Species	*Z. noltii, Z. agustifolia (Z. marina* ecotype) and *Ruppia* sp.	*Z. noltii* and *Z. marina* ecotype
Approx. size of bed (ha)	52.09	59.89
Cover range (%)	Patchy to sparse	20-100
Average cover (%)	Not specified	68.82
Sediment composition and distribution	Muddy sand and soft mud	Mud
Non-native species and pathogens	Not specified	None observed
Water quality (algal growth)	Not specified	Algae present
Anthropogenic pressures	Not specified	None observed

Table 7: Data Catalogue – Yacht haven, East Hayling

Designation	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar
Type of survey	Intertidal	Intertidal/walk over
Date	Previous data (2013)	2023
Species	*Z. noltii, Z. agustifolia (Z. marina* ecotype) and *Ruppia* sp.	*Z. noltii, Z. marina* and *Z. marina* ecotype
Approx. size of bed (ha)	6.56	11.66
Cover range (%)	Patchy to sparse	5-100
Average cover (%)	Not specified	56.4
Sediment composition and distribution	Muddy sand and soft mud	Mud
Non-native species and pathogens	Not specified	None observed
Water quality (algal growth)	Not specified	Algae present
Anthropogenic pressures	Holes in seagrass beds due to dragging mooring chains.	Gauges/dredge marks in mud possibly from boats/equipment being dragged through.

Table 8: Data Catalogue - Crake Rithe, Chichester Harbour

Designation	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar
Type of survey	Intertidal	Intertidal/walk over
Date	Previous data (2013)	2023
Species	*Z.noltii, Z. agustifolia (Z. marina* ecotype) and *Ruppia* sp.	*Z. noltii, Z. marina* and *Z. marina* ecotype
Approx. size of bed (ha)	8.63	9.80
Cover range (%)	10-80	5-100
Average cover (%)	Not specified	49.35
Sediment composition and distribution	Muddy sand and soft mud	Mud, a small amount of gravel
Non-native species and pathogens	None observed	None observed
Water quality (algal growth)	Not specified	Patches of thick algal growth present.
Anthropogenic pressures	Not specified	Discoloured mud of unknown causes.

Table 9: Data Catalogue - Horse Pond to East Head, Chichester Harbour/ Itchenor

Designation	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar
Type of survey	Intertidal	Intertidal/walk over
Date	Previous data (2013)	2023
Species	*Z. noltii* and *Z. agustifolia (Z. marina* ecotype)	*Z. noltii* and *Z. marina* ecotype
Approx. size of bed (ha)	3.65	4.91
Cover range (%)	Dense to patchy and sparse	10-95
Average cover (%)	Not specified	57.22
Sediment composition and distribution	Muddy sand and soft mud	Mud
Non-native species and pathogens	Not specified	None observed
Water quality (algal growth)	Algae present	Algae present
Anthropogenic pressures	Not specified	Signs of damage from boats Discoloured mud

Designation	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar
		Some dead seagrass plants

Table 10: Data Catalogue - Gurnard, Isle of Wight

Designation	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075)	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075)	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075)	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075)
Type of survey	Intertidal	Intertidal/Walk over	Subtidal/Drop down camera and echosounder	Intertidal/Walk over
Date	Previous data (2010)	2018	2020	2023
Species	*Z. marina*	*Z. marina*	*Z. marina (& Z. noltei near the intertidal)*	*Z. marina*
Approx. size of bed (ha)	0.36	Not specified	0.93 ha (with an additional 1.37 ha near/in the intertidal) (vs 0.94 from GIS data).	Unknown - unable to survey full extent Area surveyed: 0.84
Cover range (%)	Not specified	Records of isolated plants, groups of plants and small patches and in larger beds by Gurnard Luck; and areas of “matrix beds” comprising relatively large and dense seagrass beds separated by gaps of 1-2 m by Gurnard Cliff.	50 - 75 %	1-40

Designation	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075)	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075)	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075)	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075)
Average cover (%)	Not specified	Records of isolated plants, groups of plants and small patches and in larger beds by Gurnard Luck; and areas of “matrix beds” comprising relatively large and dense seagrass beds separated by gaps of 1-2 m by Gurnard Cliff.	Mean percentage cover of seagrass was 66.43 ± 6.87 %.	11.6
Sediment composition and distribution	Clay, occasionally sand	Relatively muddy sand sediments	Muddy sand	Sand and pebbles/rocks
Non-native species and pathogens	None observed	Not specified	Not specified	None observed
Water quality (algal growth)	None observed	Not specified	None observed	None observed
Anthropogenic pressures	None observed	Not specified	Not specified	None observed

Table 11: Data Catalogue - Thorness Bay, Isle of Wight

Designation	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075), Solent and Southampton Water SPA with marine components	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075), Solent and Southampton Water SPA with marine components
Type of survey	Subtidal/Diving	Subtidal/Diving
Date	2021	2022
Species	*Z. marina*	*Z. marina*
Approx. size of bed (ha)	Not specified	Not specified
Cover range (%)	“A dense seagrass bed.”	“Very sparse, isolated small stands of seagrass.”
Average cover (%)	“A dense seagrass bed.”	“Very sparse, isolated small stands of seagrass.”
Sediment composition and distribution	Muddy sediment	Not specified
Non-native species and pathogens	Not specified	Not specified
Water quality (algal growth)	Not specified	Not specified

Designation	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075), Solent and Southampton Water SPA with marine components	Solent Maritime SAC; Marine Conservation Zone (MCZ) (Yarmouth to Cowes: UKMCZ0075), Solent and Southampton Water SPA with marine components
Anthropogenic pressures	In places fragments of the soft mudstone bedrock appeared on the surface suggesting possible damage from anchoring.	Not specified

Table 12. Data Catalogue - Royal Victoria, Isle of Wight

Designation	Solent Maritime SAC; Solent and Dorset Coast SPA (UK9020330)
Type of survey	Intertidal/Walk over
Date	2018
Species	*Z. marina*
Approx. size of bed (ha)	Not specified
Cover range (%)	“In general, seagrass occurrence and bed size appeared to increase eastwards over the two surveys.”
Average cover (%)	“In general, seagrass occurrence and bed size appeared to increase eastwards over the two surveys.”

Designation	Solent Maritime SAC; Solent and Dorset Coast SPA (UK9020330)
Sediment composition and distribution	Not specified
Non-native species and pathogens	“A significant upper shore strandline of dead and decaying seagrass.”
Water quality (algal growth)	Not specified
Anthropogenic pressures	Not specified

Table 13: Data Catalogue - River Medina/Cowes Harbour, Isle of Wight

Designation	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC
Type of survey	Subtidal/Diving	Subtidal/Echosounder and camera	Subtidal/Echosounder and camera	Subtidal/Diving
Date	2006 (in 2024 report)	2018 (in 2024 report)	2020	2021
Species	*Z. marina*	*Z. marina*	*Z. marina*	*Z. marina*
Approx. size of bed (ha)	Judged to be of a similar size in 2020 when compared to data from 2006 (Kenworthy, 2021) i.e. 12.22 ha.	Not specified in 2024 report.	12.08 ha (Data suggests the bed extended further east than previously understood in 2006). Direct comparisons based on unit area could not be made between surveys due to underwater visibility issues preventing full mapping from taking place with the drop camera in 2020 (Kenworthy, 2021) (vs 12.09 ha from GIS data).	12.13 ha
Cover range (%)	Not specified in 2024 report.	Not specified in 2024 report.	Not specified. GIS data indicates a range of 0 to 100%. Starting at 25% when Z marina is present.	The bed was patchy with seagrass providing cover ranging from 0-100%.

Designation	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC
Average cover (%)	Not specified in 2024 report	73%	73.39 ± 5.72%	26% (decrease quite likely due to a different spatial sampling scales)
Sediment composition and distribution	Not specified in 2024 report	Not specified in 2024 report	Primarily muddy sand however poor visibility made this difficult to determine	Soft, muddy sand
Non-native species and pathogens	Not specified in 2024 report	Not specified in 2024 report	Not specified	No non-native species were recorded from the site.
Water quality (algal growth)	Not specified in 2024 report	Not specified in 2024 report	Generally absent	Mean percentage cover of algae in the seagrass beds assessed around 4.2%
Anthropogenic pressures	Not specified in 2024 report	Not specified in 2024 report	Not specified	Cowes is a busy industrial, commercial, and recreational sailing port but no evidence of those pressures were recorded.

Table 14: Data Catalogue - Cowes West, Isle of Wight

Designation	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC; Yarmouth to Cowes MCZ	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC; Yarmouth to Cowes MCZ
Type of survey	Intertidal/Walk over	Subtidal/Echosounder and camera
Date	2018	2020
Species	*Z. marina*	*Z. marina*
Approx. size of bed (ha)	Not specified	0.13 ha (vs 0.06 ha in previous study) (echosounder results indicate another patch to the west of the site which matches the location identified in the previous extent records PVI ≥ 0.2 was 0.69 ha) (vs 0.78 from GIS data).
Cover range (%)	Not specified	Not specified in the report but GIS data indicates 0 to 80%.
Average cover (%)	Not specified	Not specified in the report but GIS data shows an average of 28.3%.
Sediment composition and distribution	Not specified	Muddy sand
Non-native species and pathogens	Not specified	Not specified
Water quality (algal growth)	Not specified	No epiphytes or macroalgae

Designation	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC; Yarmouth to Cowes MCZ	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC; Yarmouth to Cowes MCZ
Anthropogenic pressures	Not specified	Not specified

Table 15: Data Catalogue – Mouth of the Beaulieu River, East Solent

Designation	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA
Type of survey	Not specified	Subtidal/Echosounder and camera + GIS data	Subtidal/Diving	GIS data/Subtidal/Camera
Date	2011 (from 2024 report)	2018 (from 2024 report)	2021 (in 2024 report)	2024 (GIS data)
Species	*Z. marina*	*Z. marina*	*Z. marina*	*Z. marina*
Approx. size of bed (ha)	Not specified in 2024 report.	12.04 ha but the bed was not fully surveyed in 2018 (in 2024 report).	Not an aim of the 2021 diving surveys, hence not specified.	N/A
Cover range (%)	Not specified in 2024 report.	Not specified in 2024 report but GIS indicates 0 to 82%.	Seagrass was only absent from one quadrat at the mouth of Beaulieu River	0 to 65%. (5 to 65% when present).

Designation	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA
			sites with all others ranging between 15-70% cover.	
Average cover (%)	38-40%	42%	(38.6% and 40.4%, 2 sites) approx. 39.5%	34.9%
Sediment composition and distribution	Not specified in 2024 report.	Not specified in 2024 report. In the GIS data, there was uncertainties, and the guess was sand predominantly (due to visibility issues).	Sand and muddy sand with a shell / cobble fraction for one of the sites.	Sand and mud/silt
Non-native species and pathogens	Not specified in 2024 report.	Not specified in 2024 report	*Crepidula* sp. were recorded. Infection score of 1.0 to 1.2 (2 sites). Epiphyte scores of 1.6 to 1.7	N/A
Water quality (algal growth)	Not specified in 2024 report.	Not specified in 2024 report. GIS data shows an average 13.9% cover when present.	10 to 15 % of algae cover (2 sites).	8 to 60%

Designation	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA	Solent and Southampton Water SPA (UK9011061); Solent Maritime SAC; Solent and Dorset Coast SPA
Anthropogenic pressures	Not specified in 2024 report.	No signs of pressures.	No confirmed evidence of anchor damage was recorded during the surveys.	No signs of pressures.

Table 16: Data Catalogue - Yarmouth East/Yarmouth Harbour, Isle of Wight

Designation	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)
Type of survey	Subtidal/Echosounder and camera	Subtidal/Diving	GIS data/Subtidal/Camera/Diving
Date	2018 (in 2024 report)	2021 (in 2024 report) and GIS data	2024 (GIS data)
Species	*Z. marina*	*Z. marina*	*Z. marina*
Approx. size of bed (ha)	61.02 ha (around Yarmouth and Bouldnor).	Not an aim of the 2021 diving surveys, hence not specified.	N/A
Cover range (%)	Not specified in 2024 report. GIS 0 to 100%	30-100%	10 to 79%
Average cover (%)	The Yarmouth Harbour site had a mean percentage cover of 68%.	The Yarmouth Harbour site had a mean percentage cover of 69.4%.	48%
Sediment composition and distribution	Not specified in 2024 report. GIS shows a majority of sand.	Thin sand layer atop a piddock-bored blue clay.	Mostly mixed sediment
Non-native species and pathogens	Not specified in 2024 report	The non-native alga *Sargassum muticum* was abundant. Dead slipper limpet shells, *Crepidula fornicata* were evident in images	*Crepidula* sp. and squid eggs observed during dive. Possibly *Asparagopsis armata*.

Designation	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)
		from the survey. Mean infection score of 1. Mean epiphyte score of 1.1.	
Water quality (algal growth)	Not specified in 2024 report. GIS data indicates a 2.7% average cover.	26.2% of cover algae.	7.3% of cover algae.
Anthropogenic pressures	Not specified in 2024 report. GIS data show uncertainties in 1 photo where there might be some signs of anchor damage.	One surveyor reported anchor scars but there is no direct evidence to demonstrate this.	None reported

Table 17: Data Catalogue - Yarmouth West, Isle of Wight

Designation	Solent and Dorset Coast (UK9020330); Solent Maritime SAC(UK0030059)
Type of survey	GIS data/Subtidal/Camera
Date	2018
Species	*Z. marina*
Approx. size of bed (ha)	11.2 ha
Cover range (%)	0 to 100%
Average cover (%)	69%
Sediment composition and distribution	GIS data indicates a majority of gravelly sand substrate
Non-native species and pathogens	Not specified
Water quality (algal growth)	GIS data indicates an average of 4.6% cover algae
Anthropogenic pressures	GIS data does not report any signs of pressure

Table 18: Data Catalogue - Bouldnor/Bouldnor West/Yarmouth 3/Yarmouth Seagrass, Isle of Wight

Designation	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)
Type of survey	Subtidal/Echosounder and camera	Subtidal/Diving	Subtidal/Diving	Subtidal/Diving	GIS data/Subtidal/Camera/ Diving
Date	2020 (in 2024 report)	2021 (in 2024 report + SeaSearch)	2022	2023	2024 (GIS data)
Species	*Z. marina*	*Z. marina*	*Z. marina*	*Z. marina*	*Z. marina*
Approx. size of bed (ha)	61.02 ha (around Yarmouth and Bouldnor)	Not an aim of the 2021 diving surveys, hence not specified	Not specified	Not specified	N/A
Cover range (%)	Not specified in 2024 report	10-80%	Not specified	Dense for the most part but with clear patches (about 2m x 2m in size) which supported abundant mixed algae	20-100%

Designation	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)
Average cover (%)	The Yarmouth 3 site had a mean percentage cover of 78%	The Yarmouth 3 site had a mean percentage cover of 48.4%	Not specified	Not specified	41.2%
Sediment composition and distribution	Not specified in 2024 report	Thin sand / sandy muddy layer also atop a piddock-bored grey-blue clay slope, becoming piddock-bored brown/black hard clay	Muddy sediment with mudstone beneath	Yarmouth: Thin veneer of muddy sediment with mudstone beneath. Bouldnor: Here the seagrass occurs at the top of a low mud cliff. Growing on soft, piddock-bored mudstone with scattered cobbles and pebbles	Mostly sand
Non-native species and pathogens	Not specified in 2024 report	Observations of *Crepidula sp.*, *Sargassum. muticum* and *Botrylloides sp.*	In May, little epiphytic growth on the leaves: mostly sparse, very short hydroids on the	Slipper limpet – *Crepidula fornicata*; Wireweed – *Sargassum muticum*;	Non reported

Designation	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)
		Mean infection score 0.6. Mean epiphyte score 0.7	leaf margin and less than 1% of the leaves showed blackening indicative of infection by *Labyrinthula zosterae*, a marine slime mould. By August, the leaves were covered in fine adherent silt which made it impossible to assess the amount of leaf blackening	Devil's Tongue Weed – *Grateloupia turuturu*; Falkenbergia phase of Harpoon Weed - *Asparagopsis armata*; Siphoned Japan Weed – *Dasysiphonia japonica*. Yarmouth: In June, blackening of the fresh leaf growth by *Labyrinthula zosterae*, a marine slime mould (<5%). By September, a minority of the leaf margins of the seagrass supported very short growths of filamentous algae which had trapped a layer of fine silt, and some of the leaves were covered all over in fine adherent silt.	

Designation	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)
				The amount of leaf blackening was similar to that reported in June (<5%) and very few epizoic animals were recorded. Bouldnor: very little blackening of seagrass leaves was observed (<2%). A small hydroid (*Kirchenpaueria sp.*) was frequent on the seagrass fronds, bryozoan crusts and epiphytic red algae were also present.	
Water quality (algal growth)	Not specified in 2024 report	48.3% of algae cover	In May, the understorey and seabed beneath the seagrass was smothered in places by filamentous brown	Yarmouth: In June, there were a few epibionts of filamentous red and brown algae and small hydroids. The seabed	12.2%

Designation	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)
			algae (*Ectocarpaceae*). In August, hydroids were absent while there were small clumps of diatoms and rare filamentous red algae on the fronds, a large proportion of which had a fringe of what is likely to have been the red alga *Rhodophysema georgei* which is known only from seagrass leaves.	beneath the Zostera was covered in places by a dense mat of filamentous brown algae (*Ectocarpaceae*), typical for the time of year, together with a diverse community of largely filamentous and foliose red algae as was reported in May 2022. Bouldnor: red algae were also present.	
Anthropogenic pressures	Not specified in 2024 report	There was suspected evidence of anchor scars at Yarmouth 3. Seabed disturbance was noticeable due to the exposure of the bedrock/clay. The	In both surveys, bare areas of seabed with fragmented mud stone which may have been caused by anchor dragging although	Yarmouth: Both visits recorded bare areas of seabed with fragmented mud stone which may have been caused by anchor dragging although	Not specified

Designation	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)	Yarmouth to Cowes MCZ; Solent and Dorset SPA (UK9020330); Solent Maritime SAC (UK0030059)
		cause of this was unknown.	direct evidence of this was not reported.	direct evidence of this was not reported.	

Table 19: Data Catalogue - Osborne, Isle of Wight

Designation	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC(UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)
Type of survey	Subtidal/Echosounder and camera	Subtidal/Diving	Subtidal/Diving	Subtidal/Diving	GIS data/Subtidal/Camera
Date	2020 (in 2024 report)	2021	2021 (in 2024 report)	2023	2024
Species	*Z. marina*	*Z. marina*	*Z. marina*	*Z. marina*	*Z. marina*
Approx. size of bed (ha)	The 2020 EA survey data again suggest an overall increase in the Osborne Bay bed extent since 2006 but the different survey seasons and methodologies between the surveys prevent any meaningful comparisons (Kenworthy, 2021). 164.7 ha	Not specified	Not specified	Not specified	N/A

Designation	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC(UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)
Cover range (%)	Kenworthy (2021) did note that limited patchiness was observed within the Osborne Bay bed where cover was high (>50% cover) close to shore and in the middle of the bed, becoming less dense at the deeper boundaries. GIS data indicates a range of 0 to 100%.	Shot, dense seagrass was recorded with areas of bare sediment in places.	Range: 5-95% Osborne 1 vs 10-95% cover Osborne 2.	Not specified	0 to70%
Average cover (%)	Not reported in 2024 report. GIS data indicates a mean of approx. 68%.	Shot, dense seagrass was recorded with areas of bare sediment in places.	~55% (54.5% Osborne 1 and 55% Osborne 2)	Not specified	Approx 21%
Sediment composition and distribution	Not reported in 2024 report. Mostly muddy sand from the GIS data.	Soft mudstone bedrock	A mix of mud, sand, and sandy mud with a fraction (unquantified) of grey-blue clay	Firm, piddock-bored mudstone with a shallow layer of fine silt about 2cm deep	Sand or mixed sediment with red slime over silt/mud

Designation	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC(UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)
			(Osborne 1). A mix of mud and sand over cobbles with patches of fragmented blue clay. Notable rocky outcrop (Osborne 2).		
Non-native species and pathogens	Not reported in 2024 report	About 15% of the Zostera shoots had blackened tips. Tall robust leaves of Zostera were heavily epiphytised by the hydroid *Laomedea angulata*. This was not the case when the area was surveyed by Natural England about a month earlier.	*Crepidula sp.* (Osborne 1 and 2), *Botrylloides sp. & Sargassum. muticum* (Osborne 1). Mean Infection score 0.5 (Osborne 2) to 0.8 (Osborne 1). Mean Epiphyte score 0.9 (Osborne 1) to 1.1 (Osborne 2).	Divers reported very little leaf blackening	Non-natives: *Amphilectus*, *Asparagopsis*, *Styla clava.*
Water quality (algal growth)	Not specified in the report but the GIS data >1% (0.09%)	Not specified	~17%	Very little accumulation of rhizomes and leaf litter. dense growth of filamentous red algae (predominantly *Aglaothamnion*	Approx. 35.6%

Designation	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC(UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)
				tenuissimum) together with a variety of other red seaweeds beneath the seagrass canopy. The non-native Wireweed (*Sargassum muticum*) was recorded as being Occasional at this site, probably due to the cobbles and pebbles at the site providing suitable attachment points	
Anthropogenic pressures	Not reported in 2024 report. GIS data shows no clear signs of anchor damage	In places fragments of the soft mudstone bedrock appeared on the surface suggesting possible damage from anchoring. The bay is a popular area for anchoring by day boats, but to date there are few if any permanent moorings. No litter was reported	Seabed disturbance was noticeable due to the exposure of clean fragments of the underlying clay. The cause of this was unconfirmed (Osborne 1). Seabed disturbance was again noticeable due to the exposure of the bedrock/clay. The cause of this was	Not specified	No confirmed sights of anchor damage

Designation	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC(UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)	Solent and Dorset Coast SPA (UK9020330); Solent Maritime SAC (UK0030059)
		by any of the dive teams.	unknown although the surveyors noted the high number of boats in the area (Osborne 2).		

Table 20: Data Catalogue - Farlington, Langstone Harbour

Designation	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar	Langstone Harbour SSSI, Solent Maritime SAC and Chichester and Langstone Harbours SPA and Ramsar
Type of survey	Intertidal/walk over	Intertidal/walk over
Year	Previous data (2014)	2023
Species	*Z. noltii* and *Z. agustifolia (Z. marina* ecotype)	*Z. noltii, Z. marina* and *Z. marina* ecotype
Approx. size of bed (ha)	0.71 - not directly comparable as different areas were surveyed	Unknown - unable to survey full extent Area surveyed: 2.49
Cover range (%)	Dense	10-100
Average cover (%)	Not specified	47.08
Sediment composition and distribution	Muddy sand and mud	Mud
Non-native species and pathogens	None observed	None observed
Water quality (algal growth)	Not specified	Algae present
Anthropogenic pressures	None observed	None observed

Appendix B: GIS data

Geographic Information Systems (GIS) were used alongside the reports provided by Natural England, they included:

- **2018 subtidal seagrass survey** – This data covered the sites at the mouth of the Beaulieu River, Yarmouth (from West Yarmouth to Bouldnor), and The Needles (Totland and Colwell Bay). Data included information on the seagrass bed extent, sediment type, and cover of *Zostera marina*, algae, kelp, non-native wireweed (*Sargassum muticum*), and bare ground. The presence or absence of anchor scars was also noted and any other useful comments, such as dead seagrass, presence of epiphytes, and visibility. It is important to note that the Needles site is not part of the Solent Maritime SAC, however the data was still analysed.
- **2020 subtidal seagrass survey** – This data covered the River Medina/Cowes Harbour, Cowes West, Osborne Bay, and Gurnard. Both echosounder and Ground Investigation (GI) data were provided as well as seagrass extent polygon layers. Data included seagrass bed extent, sediment type, and cover of *Zostera marina*, algae, kelp, wireweed, and bare ground. Notes on the presence or absence of anchor scars and comments on any dead seagrass, presence of epiphytes, and visibility were also made. Additionally, the echosounder provided information on the Percentage Volume Inhabited (PVI) used as a proxy for seagrass cover, and the bio-height used to measure the seagrass canopy, amongst other parameters.
- **2021 subtidal seagrass survey –** This data covered the sites of at the mouth of the Beaulieu River (near Lepe), Calshot, Yarmouth (Yarmouth West and Bouldnor), Cowes Harbour/River Medina, and Osborne Bay, collected by the Natural England Dive Team. Data includes the cover of *Zostera marina*, shoot density (per 0.25m^2), longest leaf length, the presence or absence of flowering or eggs (e.g. of invertebrates) and abundance scores for infection or epiphytes, as well as the cover of algae. An additional GIS layer was made available which included counts of seeding shoots at the mouth of the Beaulieu River, Calshot, Osborne Bay, Priory Bay, and St Helen's Fort.
- **2024 diving survey -** This data was available for the mouth of the Beaulieu River (from Warren Flat to Lepe), Yarmouth (West to Bouldnor), and Osborne Bay, collected by the Natural England Dive Team. The data consisted of plant counts, leaf counts, infection and epiphyte scores, longest leaf length measurements, shoot counts, flowering presence, or absence, cover of seagrass and algae, sediment type and any other useful comments on anthropogenic impacts, invasive species, and notable species. Further data were also made available for the mouth of the Beaulieu River and Osborne Bay from a camera survey in 2024 that complemented the diving survey and included This camera survey data included the cover of *Zostera marina*, algae, wireweed and bare ground, abundance of epiphytes and infection/disease, presence of kelp, sediment type and anthropogenic impacts. This survey has been summarised in Table 2 but there was insufficient time to incorporate the data into GIS and analysis).

Appendix C: Reports

Table 21: List of the reports made available to this study.

Author(s)	Report details
Ferrero, T.J. (2018)	Solent Maritime SAC Isle of Wight Eelgrass Surveys 2018 - Fieldwork Report. Hampshire and Isle of Wight Wildlife Trust, Report No. HIWWT-LS 20190116. 12 pp.
Lee, J. (2018)	Recreational anchoring and mooring in Marine Protected Areas (MPAs): Activity data collection, Defra.
Kenworthy, J. (2021)	LIFE Recreation ReMEDIES – River Medina and Osborne Bay, Isle of Wight Subtidal Seagrass Survey 2020. LIFE Recreation ReMEDIES Report. Environment Agency Report for Natural England. Natural England.
Bolton, C. (2021)	Seasearch in the LIFE EU Recreation ReMEDIES project - survey activities during 2021. 18pp.
Baldock, L. (2022)	Summary report for ReMEDIES seagrass monitoring dives 2022. Solent Maritime SAC, Hampshire, and Isle of Wight Seasearch. 3pp.
Baldock, L. (2023)	Summary report for ReMEDIES seagrass monitoring dives 2022. Solent Maritime SAC, Hampshire, and Isle of Wight Seasearch. 7pp.
Doggett, M. & Northen, K.O. (2024)	Condition assessment monitoring for subtidal seagrass beds, Solent Maritime SAC June 2021. A report to Natural England by Marine Ecological Solutions Ltd.
Perry, C. (2024)	Solent & Isle of Wight Intertidal Seagrass Survey 2023. NECR552. Natural England.

Appendix D: Additional data

Survey areas not part of the Solent Maritime SAC

Table 22: Data Catalogue - Needles, Isle of Wight

Designation	The Needles MCZ; Solent and Dorset Coast SPA (UK9020330)
Type of survey/data	GIS data from Subtidal/Camera
Date	2018
Species	*Z. marina*
Approx. size of bed (ha)	14.68 ha
Cover range (%)	0-98%
Average cover (%)	35%
Sediment composition and distribution	Sand in majority
Non-native species and pathogens	Not specified
Water quality (algal growth)	17.8% average of red algae
Anthropogenic pressures	No signs of pressures

Table 23: Data Catalogue - Calshot, East Solent

Designation	Solent & Southampton Water SPA and Ramsar	Solent & Southampton Water SPA and Ramsar
Type of survey	Intertidal/walk over	Intertidal/walk over
Year	Previous data (2013)	2023
Species	*Z. marina* and *Z. noltii*	*Z. marina*, one small patch of *Z. noltii*
Approx. size of bed (ha)	42.58	Unable to survey full extent Area surveyed: 27.66
Cover range (%)	Patchy to dense	25-95
Average density (%)	Not specified	55.83
Sediment composition and distribution	Not specified	Sand
Non-native species and pathogens	None observed	None observed
Water quality (algal growth)	Not specified	Algae present
Anthropogenic pressures	Damage by bait digging.	None observed

Table 24: Data Catalogue - Fareham Lake, Cams Bay, Portsmouth Harbour (3a and 3b)

Designation	Portsmouth Harbour SSSI, SPA and Ramsar	Portsmouth Harbour SSSI, SPA and Ramsar
Type of survey	Intertidal/walk over	Intertidal/walk over
Year	Previous data (2014)	2023
Species	*Z. noltii, Z. marina* and *Z. agustifolia (Z. marina* ecotype)	*Z. noltii* and *Z. marina*
Approx. size of bed (ha)	11.64	28.20
Cover range (%)	Patchy to dense	30-80
Average cover (%)	Not specified	51.25
Sediment composition and distribution	Mud	Mud with some gravel on western edge.
Non-native species and pathogens	None observed	None observed
Water quality (algal growth)	Algae present in abundance in several areas.	Algae present in abundance.
Anthropogenic pressures	Dredging and trampling damage.	Gauges/dredge marks in mud possibly from boats/equipment being dragged through. Pollution

Table 25: Data Catalogue - Seagrove to Priory Bay and Bembridge, Isle of Wight/ Priory Bay

Designation	Solent & Southampton Water SPA and Ramsar and Brading Marshes to St Helen's Ledges SSSI; MCZ (Bembridge: UKMCZ0054)	Solent & Southampton Water SPA and Ramsar and Brading Marshes to St Helen's Ledges SSSI; MCZ (Bembridge: UKMCZ0054)
Type of survey	Intertidal	Intertidal/walk over
Date	Previous data (2014)	2023
Species	*Z. noltii* and *Z. marina*	*Z. noltii* and *Z. marina*
Approx. size of bed (ha)	0.95	0.31
Cover range (%)	Not specified	5-100
Average cover (%)	Patchy to 100% cover in some places.	45.9
Sediment composition and distribution	Sandy with occasional patches of pebbles.	Sand
Non-native species and pathogens	*Sargassum muticum* recorded in patches and up to 70% coverage.	None observed
Water quality (algal growth)	Evidence of storm damage.	Algae present
Anthropogenic pressures	Not specified	None observed

Table 26: Data Catalogue - Seagrove to Priory Bay and Bembridge, Isle of Wight/ Bembridge Bay

Designation	Solent & Southampton Water SPA and Ramsar, South Wight Maritime SAC and Whitecliff Bay and Bembridge Ledges SSSI; MCZ (Bembridge: UKMCZ0054)	Solent & Southampton Water SPA and Ramsar, South Wight Maritime SAC and Whitecliff Bay and Bembridge Ledges SSSI; MCZ (Bembridge: UKMCZ0054)
Type of survey	Intertidal	Intertidal/walk over
Date	Previous data (2014)	2023
Species	*Z. noltii* and *Z. marina*	*Z. marina*
Approx. size of bed (ha)	6.75	Unable to survey full extent Area surveyed: 1.03
Cover range (%)	Not specified	30-100
Average cover (%)	Patchy to 100% cover in some places	70
Sediment composition and distribution	Sandy with occasional patches of pebbles.	Pebbles and gravel with some sand
Non-native species and pathogens	*Sargassum muticum* recorded in patches and up to 70% coverage.	None observed
Water quality (algal growth)	Evidence of storm damage.	Algae present
Anthropogenic pressures	Aggregate extraction activity close to beds.	None observed

Table 27: Data Catalogue - Seagrove to Priory Bay and Bembridge, Isle of Wight/ Bembridge Point

Designation	Solent & Southampton Water SPA and Ramsar, South Wight Maritime SAC and Whitecliff Bay and Bembridge Ledges SSSI; MCZ (Bembridge: UKMCZ0054)	Solent & Southampton Water SPA and Ramsar, South Wight Maritime SAC and Whitecliff Bay and Bembridge Ledges SSSI; MCZ (Bembridge: UKMCZ0054)
Type of survey	Intertidal	Intertidal/walk over
Date	Previous data (2014)	2023
Species	*Z. noltii, Z. marina* and *Z. agustifolia (Z. marina* ecotype)	*Z. marina*
Approx. size of bed (ha)	2.17	Unable to survey full extent Area surveyed: 0.86
Cover range (%)	>70%	0-100
Average cover (%)	Patchy to 100% cover in some places	67.14
Sediment composition and distribution	Sandy with occasional patches of pebbles	Sand
Non-native species and pathogens	Extensive *Sargassum muticum*	None observed
Water quality (algal growth)	Not specified	Algae present
Anthropogenic pressures	None observed	None observed, some dead seagrass of unknown cause.

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